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Special Technical Report 12 - Addendum

**SUBJECT INDEX FOR SURVEY OF LITERATURE  
PERTAINING TO THE EQUATORIAL IONOSPHERE D D C  
AND TROPICAL COMMUNICATION**

By: G. H. HAGN K. A. POSEY H. W. PARKER

Prepared for:

U.S. ARMY ELECTRONICS COMMAND  
FORT MONMOUTH, NEW JERSEY

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## ABSTRACT

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This addendum is a subject index for Special Technical Report 12 on this contract, DA 36-039-AMC-00040(E), "Survey of Literature Pertaining to the Equatorial Ionosphere and Tropical Communication." The greatest numbers of subjects have to do with equatorial aeronomy, but topics under geomagnetism, jungle radio propagation radio noise, and special equipment and antennas related to studies in the fields cited are included. The literature search involved documents published over a period of about 40 years, ending with 1964, with the greater weight being placed on work published in the latter years.



## PREFACE

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This report is a subject index to "Survey of Literature Pertaining to the Equatorial Ionosphere and Tropical Communication," Special Technical Report 12, on Contract DA 36-039-AMC-00040(E). The literature survey in that report is organized alphabetically by the first author's last name and includes a list of the authors represented. While this organization is convenient for those already familiar with the literature of low-latitude aeronomy, the approach is less useful for other readers. The authors think a subject index enhances the value of any literature survey. This index is organized alphabetically by subject. The listings under each subject give the first author's last name and the year of publication. The user is advised to check Special Technical Report 12 for all articles by an author for the year of interest, since no distinction has been made when more than one article appears for any given author in a year.

## CONTENTS

---

ABSTRACT . . . . .	111
PREFACE . . . . .	v
LIST OF TOPICAL HEADINGS . . . . .	ix
SUBJECT INDEX . . . . .	1

# LIST OF TOPICAL HEADINGS

Absorption . . . . .	1
Accra, Ghana . . . . .	2
Acoustic Waves . . . . .	2
Africa . . . . .	2
Ahmedabad, India . . . . .	3
Airglow . . . . .	3
Allahabad, India . . . . .	4
Amateur Radio . . . . .	4
Anisotropy . . . . .	4
Anomalies . . . . .	5
Antenna . . . . .	6
Atlantic Ocean . . . . .	6
Atmospheric Noise . . . . .	6
Aurora . . . . .	7
Backscatter . . . . .	9
Baguio, Philippines . . . . .	9
Balboa, Canal Zone . . . . .	9
Bangalore, India . . . . .	10
Banaras, India . . . . .	10
Bangui, Africa . . . . .	10
Bengal, India . . . . .	10
Bibliographies . . . . .	10
Bifurcation . . . . .	11
Brisbane, Queensland . . . . .	11
Broadcasting . . . . .	11
Calcutta, India . . . . .	13
Canton, Phoenix Islands . . . . .	13
Coherent Scatter . . . . .	13

# LIST OF TOPICAL HEADINGS (Continued)

Collision Frequency (see Electron Collision Frequency) . . . . .	14
Conductivity (Ionosphere) . . . . .	14
Continuous Wave . . . . .	14
Cosmic Radio Noise . . . . .	15
Critical Frequencies . . . . .	15
Dacca, Bengal, India . . . . .	16
Dakar, Senegal . . . . .	16
Delhi, India . . . . .	16
Diffusion . . . . .	16
Direction Finding . . . . .	17
Disturbance Daily Variation . . . . .	17
Diversity . . . . .	18
Doppler Technique . . . . .	18
D Region (D Layer) . . . . .	18
Drifts, Ionospheric . . . . .	18
Dynamo Theory . . . . .	20
Earth Currents . . . . .	22
Echoes . . . . .	22
Eclipse . . . . .	22
E Layer . . . . .	22
E1 Layer . . . . .	22
E2 Layer . . . . .	23
Electrojet, Equatorial . . . . .	23
Electrojet, Polar . . . . .	24
Electron Collision Frequency . . . . .	25
Electron Density . . . . .	25
Emission (see Airglow) . . . . .	26
Equatorial Anomaly (see Anomalies) . . . . .	26
Equatorial Ionosphere . . . . .	27
Equatorial E <sub>s</sub> (see Sporadic E) . . . . .	27
Equatorial Trough (see Anomalies) . . . . .	27
Equipment . . . . .	28
E Region . . . . .	28



# LIST OF TOPICAL HEADINGS (Continued)

E <sub>s</sub> (see Sporadic E) . . . . .	29
Exosphere . . . . .	29
Extraordinary Ray . . . . .	29
Fading . . . . .	30
Faraday Effect . . . . .	31
Field-Aligned Irregularities . . . . .	31
Field Strength . . . . .	32
F Layer . . . . .	32
F1 Layer . . . . .	34
F1.5 Layer . . . . .	34
F2 Layer (see F2 Region) . . . . .	34
Flutter Fading . . . . .	34
F2 Region . . . . .	35
Focusing . . . . .	40
f <sub>o</sub> F2 . . . . .	40
General Ionosphere . . . . .	41
Geomagnetism . . . . .	41
Geomagnetic Anomaly (see Anomalies) . . . . .	42
Geomagnetic Control of Ionosphere . . . . .	42
Geomagnetic Disturbances . . . . .	43
Geomagnetic Equator . . . . .	43
Geomagnetic Field . . . . .	44
Geomagnetic Sudden Impulses . . . . .	46
Geomagnetic Tides . . . . .	46
Geomagnetic Storms . . . . .	46
Ghana . . . . .	46
Ground Constants . . . . .	46
Ground Wave . . . . .	47
Group Velocity . . . . .	47
Gyro-Frequency . . . . .	47
Haifa, Israel . . . . .	48
Hawaii . . . . .	48

# LIST OF TOPICAL HEADINGS (Continued)

Horizon Focusing . . . . .	48
Horizontal Gradient . . . . .	48
Huancayo, Peru . . . . .	48
Ibadan, Nigeria . . . . .	51
IGY . . . . .	51
Incoherent Scatter . . . . .	52
India (see also Individual Stations) . . . . .	52
Intertropical Zone . . . . .	52
Ionogram, Equatorial . . . . .	52
Ionosphere (see General Ionosphere) . . . . .	52
Ionosphere Currents . . . . .	53
Ionospheric Storm . . . . .	53
Irregularities, Ionospheric . . . . .	53
Johannesburg, S. Africa . . . . .	55
Jungle Radio Communication . . . . .	55
Khartoum, Sudan . . . . .	56
K-Indices . . . . .	56
Kjeller, Norway . . . . .	56
Kodaikanal, India . . . . .	56
Kokobunji, Japan . . . . .	56
Koror, Palau Islands . . . . .	56
Kwajalein, Marshall Islands . . . . .	56
Leopoldville-Binza, Congo . . . . .	57
Lightning . . . . .	57
Lima, Peru . . . . .	57
Linearly Polarized Antenna . . . . .	57
Longitude Effect . . . . .	57
Loran . . . . .	58
Lowest Useful Frequency (LUF) . . . . .	58
LUF Lunar Effects . . . . .	58
Lunar Tide . . . . .	58
Lunar Variations . . . . .	59

# LIST OF TOPICAL HEADINGS (Continued)

Lwiro, Congo . . . . .	59
Macao . . . . .	60
Madras, India . . . . .	60
Magnetic Activity . . . . .	60
Magnetic Coordinates . . . . .	60
Magnetic Equator (see Geomagnetic Equator) . . . . .	60
Magnetic Field . . . . .	61
Magnetic Parameters . . . . .	61
Magnetic Storms . . . . .	61
Magneto-Hydrodynamics . . . . .	62
Magneto-Ionic Theory . . . . .	62
Maximum Usable Frequencies (MUF) . . . . .	63
Mayagüez, Puerto Rico . . . . .	63
Medium Wave . . . . .	63
Meteors . . . . .	63
Micropulsation . . . . .	63
Microwave . . . . .	64
Midday Decrease, $f_oF_2$ . . . . .	64
Modulation . . . . .	64
Monrovia, Libya . . . . .	64
MUF (see Maximum Usable Frequencies) . . . . .	64
Multipath . . . . .	65
Multiple Reflections . . . . .	65
Nairobi, Kenya . . . . .	66
Natal, Brazil . . . . .	66
Natal, S. Africa . . . . .	66
New Zealand . . . . .	66
Noon Minimum (see Midday Dec . . . . .	66
Nuclear Explosion . . . . .	66
Oblique Incidence . . . . .	67
Parabolic Layer Method . . . . .	68
Phase Stability . . . . .	68

# LIST OF TOPICAL HEADINGS (Continued)

Philippine Islands . . . . .	68
Plasma . . . . .	68
Polarization, Wave . . . . .	68
Poona, India . . . . .	69
Prediction, Ionospheric . . . . .	69
Pulses . . . . .	69
Radio Noise . . . . .	70
Radio Star Observations . . . . .	70
Ray Tracing . . . . .	70
Recombination Coefficients . . . . .	70
Reflection . . . . .	70
Refraction . . . . .	71
Regularities . . . . .	71
Ring-Current . . . . .	71
Rocket Measurements . . . . .	71
San Juan, Puerto Rico . . . . .	72
Satellite . . . . .	72
Scattering . . . . .	72
Scintillations . . . . .	73
Short-Path Communication . . . . .	73
Singapore . . . . .	74
Skywave . . . . .	74
Slant Sporadic E (see Sporadic E) . . . . .	74
Slough, England . . . . .	74
Solar Activity . . . . .	74
Solar Eclipse . . . . .	75
Solar Flare . . . . .	76
Solar Tides . . . . .	76
Sounders . . . . .	77
Splitting . . . . .	77
Sporadic E . . . . .	77
Spread F . . . . .	80

# LIST OF TOPICAL HEADINGS (Continued)

Sq Current . . . . .	82
Stratification . . . . .	82
Stratosphere . . . . .	82
Sudden Commencement . . . . .	82
Sunrise . . . . .	83
Sunset . . . . .	83
Sunspot Cycle . . . . .	84
Super-Refraction . . . . .	84
Symposia . . . . .	84
Talara, Peru . . . . .	86
Tamanrasset, Algeria . . . . .	86
Thunderstorm . . . . .	86
Tilt . . . . .	86
Tirupati, India . . . . .	86
Tiruchirapalli, India . . . . .	87
Topside Sounding . . . . .	87
Townsville, Australia . . . . .	87
Transequatorial . . . . .	87
Transmission Loss, Ionospheric . . . . .	88
Travelling Disturbance . . . . .	88
Tri, , Libya . . . . .	88
Trivandrum, India . . . . .	88
Tropical Communication . . . . .	88
True Height . . . . .	89
Tsumeb, S. W. Africa . . . . .	89
UHF . . . . .	90
Velocity . . . . .	91
Vertical Incidence . . . . .	91
VHF Propagation . . . . .	91
Virtual Height . . . . .	92
VLF Propagation . . . . .	92
Waltair, India . . . . .	93

## LIST OF TOPICAL HEADINGS (Concluded)

Washington, D.C. . . . .	94
Watheroo, Australia . . . . .	94
Weather . . . . .	94
Winds . . . . .	94
Z Echo . . . . .	95

## SUBJECT INDEX

### ABSORPTION (see also COSMIC RADIO NOISE; D-REGION; JUNGLE RADIO COMMUNICATION)

- Estimated, of pulses from Delhi to Calcutta (Baral 1952)
- By jungle, measurements described (Bateman 1944)
- The frequency variation of (Bibi 1959)
- Studies on, at Calcutta (Chatterjee 1952)
- At 25 Mc/s, associated with solar events and magnetic storms (Degsonkar 1962)
- At Dakar (Delobea 1956)
- Calculated for a plasma (Denisov 1959)
- Investigations of, at Hawaii and Johnston Island (Fredriksen 1960)
- Of HF Waves, under Q.T. approximation (Hagn 1963)
- At VHF--attenuation through jungle and woods (Krevsky 1963)
- Analysis of variations of (Lange-Hesse 1952)
- In D region at Singapore and Slough, 27-day variation of (Lange-Hesse 1953)
- And Temperature variation (Lepechinsky 1951)
- Method of determining relative, in D and E regions (Mitra, A.P., 1955)
- Of cosmic radio noise, determination of electron content of outer ionosphere from measurements of (Mitra, A.P., 1961)
- Interpretation of observed zenith-angle dependence of (Mitra, A.P., 1963)
- Measurements of, at Delhi (Mitra, S. N., 1957)
- And refraction indices of the ionosphere (Murty, Y.S.N., 1963)
- And atmospheric scale height gradient (Nicolet 1951)
- On variation of ionospheric absorption at different stations (Piggott 1955)
- Discrepancies in measurement values of, using multiple reflections (Piggott 1960)
- Investigation of, on 5.65 Mc/s at Waltair (Ramana 1961)
- Resulting from solar flare of 23 Feb., 1956, on vertical-incidence pulse soundings (Ramanathan 1956)

## ABSORPTION (Continued)

Diurnal variation of, on 5.65 Mc/s at Waltair, during IGY (Rao, B. R., 1958)

In ionosphere over Delhi (Rao, B.V.T., 1958)

Investigations of, at Delhi (Rao, M. K., 1962)

Deviative, and E-Region collision frequency (Schlapp 1959)

Measurement of, at 2.5 Mc/s at Ahmedabad (Shirke 1959)

In equatorial ionosphere (Skinner 1956)

Of Short radio waves in the D, E and F regions (Whitehead 1959)

## ACCRA, GHANA

HF propagation over 8500 km path received at (Agy 1962)

Flutter fading observed at (Barghausen 1962)

HF path between Monrovia and (Barghausen 1963)

HF path between Tripoli, Libya, and (Barghausen 1964)

Doppler studies of equatorial flutter fading between Tripoli, Libya, and (Calvert 1962)

## ACOUSTIC WAVES

Field-aligned E-region irregularities identified with acoustic plasma waves (Bowles 1963)

## AFRICA (see also individual stations)

Survey of ionospheric research in (Bailey 1963)

Medium-frequency broadcasting possibilities in (Barghausen 1964)

Propagation curves for VHF/UHF broadcasting on the African continent (CCIR 1963)

Solar eclipse, 25 February 1952, effects on F region in equatorial Africa (Estrabaud 1952, 1953)

Atmospheric super-refraction and anomalous propagation in (Phillips, W. E., 1951)

Abnormal variations in geomagnetic field and the ionizations in F2 and Es regions over Central Africa (Rastogi 1961, 1962)



## AHMEDABAD, INDIA

Cosmic radio noise at 25 Mc/s at (Bhonsle 1958)  
Magnetic storms and cosmic radio noise at (Bhonsle 1960)  
Solar flares and cosmic noise on 25 Mc/s at (Bhonsle 1960)  
Sporadic echoes from E region over (Kotadia 1956)  
Ionospheric F2 layer during sunspot minimum (Kotadia 1956)  
F1.5 layer at (Kotadia 1959)  
Spread F over (Kotadia 1959)  
Magnetic and ionospheric disturbances in low latitudes near  
(Kotadia 1961)  
Effects of solar flare of 23 February 1956, and associated iono-  
spheric effects at (Ramanathan 1956)  
Cosmic radio noise absorption and magnetic storms at (Ramanathan  
1961)  
Intermediate layers between E and F1 over (Rastogi 1954)  
Field-strength measurements of radio waves during partial solar  
eclipse of 14 December 1955 at (Rastogi 1956)  
Two types of development of E2 layer at (Rastogi 1956)  
Ionospheric observations at (Rastogi 1955 through 1959)  
Rate of fading of reflected pulses at vertical incidence at  
(Sethuraman 1958)  
Total electron content of F region over (Sheriff 1956)  
Measurement of ionospheric absorption on 2.5 Mc/s at (Shirke 1959) ..  
F scatter and cosmic radio noise on 25 Mc/s at (Shirke 1962)  
SID effects on 164 Kc/s transmissions from Tashkent to (Shirke 1963)  
Electron density profiles at (Shirke 1963)

## AIRGLOW

Researches on 6300 line of, at Tamanrasset (Barbier 1959)  
Emission of red line of, at Tamanrasset (Barbier 1961)  
Observations of, near the equator (Blackwell 1960)  
Night-sky red line of, at the equator (Delsemme 1960)  
Observations of, during IGY (Gates 1959)

## **AIRGLOW (Continued)**

Arcs, associated with field-aligned irregularities and the outer Van Allen belt (Matthew 1962)

Latitude effect of the oxygen red line of (Nakamura 1961)

Behavior of 6300 [O1] line of, at Huancay (Silverman 1961)

F-region anomaly associated with (Thomas 1962)

## **ALLAHABAD, INDIA**

Ionospheric echoes on 4 Mc/s at (Bajpai 1936)

Further studies of F region at (Bajpai 1939)

Ionospheric height at (Bansal 1936)

Ionosphere at (Pant 1936)

Electron density at (Toshnival 1935, 1936)

Radio studies of upper atmosphere at (Toshnival 1937)

Ionospheric height measurement at (Toshnival 1944)

## **AMATEUR RADIO**

ARRL-IGY transequatorial VHF scatter propagation research project (American Radio Relay League 1959)

Observations of equatorial scatter during IGY (Southworth 1960)

## **ANISOTROPY**

Induction of electric currents in an anisotropic ionosphere (Ashour 1964)

Anisotropic field-aligned irregularities in the equatorial ionosphere (Egan 1960)

Theory of electrostatic fields in the ionosphere idealized (Farley 1959, 1960)

Asymmetry of F2 region from northern to southern hemisphere (Rastogi 1960)

Variation in height of, and random drift velocity of irregularities (Rao, B. R., 1961)

Of ionospheric irregularities in E region (Rao, G.L. N., 1963)

Effect of magnetic activity on (Rao, P.B., 1946)

Seasonal and diurnal variation of (Rao, P.B., 1963)

## ANISOTROPY (Continued)

Height variation of drift and (Rao, P.B., 1964)

## ANOMALIES (see also BACKSCATTER; DIFFUSION)

Seasonal and annual, in total electron content (Altman 1963)

Regional, in  $f_oF_2$  (Aono 1953)

Two, in ionosphere near equator (Appleton 1946)

Geomagnetic, in the F2 layer (Appleton 1947, 1953)

Belt of, in equatorial F2 layer (Appleton 1954)

And regularities in ionosphere (Appleton 1956)

In equatorial F2 layer (Appleton 1960)

In E layer (Appleton 1961)

Equatorial trough in  $f_oF_2$  (Bailey 1948)

Noon F2 layer ionization and magnetic dip (Bhar 1957, 1959)

Diurnal, in maximum electron density over Koduikanal (Bhargava 1962)

In the behavior of equatorial F2 layer (Croom 1959)

South Atlantic magnetic, detail maps of (Dudziak 1963)

Geomagnetic distortion in F2 region (Hasegawa 1954)

South Atlantic magnetic: East-west asymmetry in the flux of mirroring geomagnetically trapped protons (Heckman 1962)

Interpretation of, by ionospheric drift (Hiroto 1959)

Equatorial sunset effect (Humby 1959)

Geomagnetic, and possible interpretation (Lepachinsky 1955)

Geomagnetic, and F2 region (Lyon 1962)

Variations of noon values of  $f_oF_2$  with magnetic latitude (Lyon 1963)

Pitch-angle distribution of the photoelectrons and origin of the geomagnetic anomaly in the equatorial F2 layer (Mariani 1964)

Geomagnetic, of F2 region (Martyn 1955)

Latitude dependence of  $f_oF_2$  over the range  $20^\circ$  N to  $69^\circ$  S (Ose 1959)

Geomagnetic, during sunspot maximum (Rao, C.S.R., 1962)

Diurnal development of anomalous equatorial belt in F2 region (Rastogi 1959)

Equatorial, F-region electron densities and height variations (Somayajulu 1963)

Seasonal, in F region (Wright, J. W., 1962, 1963)

## **ANTENNA (see also EQUIPMENT)**

Rotating spaced loops (Bowman 1960)  
Antenna design for tropical broadcasting (CCIR 1963)  
Scale-model measurements of sloping wire antenna (Cory 1963)  
Measured impedance of tactical antenna (Cory 1964)  
For broadcasting in tropics (Dickinson 1956)  
Antenna engineering handbook (Jasik 1961)  
Experiments with an aerial system for suppressing the ground wave (Khastgir 1940)  
Linear communication antennas (Laitinen 1957)  
HF skywave transmission over short or moderate distances using half-wave horizontal or sloping antennas (NDRC 1944)  
Radiation from antennas in the 2-to-30-Mc/s band (Signal Corps RPA 1958)  
Highly directional array for observing field-aligned irregularities (Thomas 1960)  
Curves of ground proximity loss for Dipole (Vogler 1963)

## **ATLANTIC OCEAN**

Ionospheric observations over (Bukin 1961)  
Detail maps of South Atlantic anomaly (Dudziak 1963)  
South magnetic anomaly studied by satellite (Heckman 1962)

## **ATMOSPHERIC NOISE (see also COSMIC RADIO NOISE; THUNDERSTORM; LIGHTNING)**

Measurement of, in southwest Pacific area (Bateman 1944)  
Amplitude and phase spectrum of (Bhattacharya 1963)  
Attenuation characteristics of (Bhattacharya 1964)  
Over tropical land mass (CCIR 1963)  
Level of, for tropical broadcasting (CCIR 1963)  
Measurement of, interference to broadcasting (Chandrashekhar Aiya 1954)  
In 3-Mc/s band at Poona (Chandrashekhar Aiya 1955)  
Conversion data for, interference measurements (Chandrashekhar Aiya 1958)  
And interference to short-wave broadcasting (Chandrashekhar Aiya 1958)

## ATMOSPHERIC NOISE (Continued)

- And interference to medium-wave broadcasting (Chandrashekhar Aiyar 1958)
- Average power of, impulsive (Chandrashekhar Aiyar 1959)
- And interference in standard broadcast band at Poona (Chandrashekhar Aiyar 1959)
- Measurement and description of (Chandrashekhar Aiyar 1959)
- At Poona, in 2.5-to-20.0-Mc/s band (Chandrashekhar Aiyar 1959)
- And HF noise radiators in lightning ground flashes (Chandrashekhar Aiyar 1960)
- Structure of (Chandrashekhar Aiyar 1962)
- For the period 1 December 1957 to 28 February 1958 (Crichlow 1958)
- For the period June 1 to November 30, 1957 (Crichlow 1958)
- Special report on (Crichlow 1960)
- Solar-flare effects on, at 2.5 and 5.0 Mc/s (Herman 1961)
- Reception of, at HF (Horner 1953)
- Revised radio noise data (Kelley 1960)
- Studies in, using warbler method (Khastger 1940, 1942)
- An attempt to observe whistlers near the equator (Koster 1955)
- Short-term time characteristics of, impulsive (Lakshminarayan 1962)
- Level of, in the longest wave region, and its diurnal and annual variations (Lauter 1958)
- And interference to 5 Mc/s broadcast band at Poona (Phadke 1955)
- Wave forms of, at Madras (Rajam 1936)
- Study of, at VLF at Delhi (Sachdev 1958)
- Measurement of, during nuclear explosions (Saha 1964)
- Short-term amplitude probability distribution of, impulsive (Satyam 1962)
- Long-term amplitude probability distribution of (Satyam 1962)
- Hourly variation of, seasonal (Satyam 1962)

## AURORA

- Fading correlation bandwidth and short-term frequency stability on HF transauroral path (Auterman 1962)
- Similarity of auroral echoes to equatorial echoes (Bowles 1960)

## AURORA (Continued)

Auroral echoes related to echoes from equatorial field-aligned ionization (Bowles 1963)

Magnetohydrodynamics (Ferraro 1955)

From geomagnetically trapped radiation (Kegn 1961)

And world-wide magnetic distributions (Rostad 1935)

Rare tropical aurora observed at Apia (Utlaut 1959)

High auroral arcs and night-time electrojets (Vestine 1960)

Fading and attenuation of HF radio waves over long paths crossing auroral and equatorial zones (Yeh 1960)

## BACKSCATTER (see also BIBLIOGRAPHIES; ECHOES)

- And transequatorial propagation (American Radio Relay League 1959)
- Suggested by work at Banaras (Banerjee. S. S., 1952)
- Of radio waves from equatorial F region Clemesha 1963
- Characteristics of, observed at a frequency of 21.6 Mc/s (Dueño 1958)
- Peculiarities and seasonal variations of, transequatorial Dueño 1960
- Interpretation of some sweep-frequency (Dueño 1963)
- Incoherent; effect of Faraday rotation on (Mi'man 1961)
- Possible use for exospheric sounding (Obayashi 1959)
- Theory of spread F, based on aspect-sensitive echoes (Renau 1960)
- Effect of magnetic field in (Salpeter 1961)
- Transequatorial, observed at Brisbane (Thomas 1961)
- Lunar control of abnormal transequatorial propagation observed by using (Thomas 1962)
- Sounder, instrumentation for observation of field-aligned F-region irregularities and transequatorial radio propagation (Thomas 1962)
- Anomalous transequatorial propagation observed by using (Thomas 1962)
- Observations of transequatorial, from Brisbane (Thomas 1962)
- Final report on transequatorial propagation by using (Thomas 1962)
- Failure to produce exospheric propagation by using (Thomas 1962)
- Reveals anomalous transequatorial propagation (Villard 1957)
- Studies of transequatorial propagation by using (Villard 1957)

## BAGUIO, PHILIPPINES

- Bifurcation of F region at (Marasigan 1958)
- Geomagnetic sunspot influences on spread F at (Marasigan 1960)

## BALBOA, CANAL ZONE, PANAMA

- Stratospheric upper air studies at (Belmont 1962)

## **BANGALORE, INDIA**

Spring thunderstorms over (Chandrashekhar Aiyar 1963)

## **BANARAS, INDIA**

Observations of 31 meter signals from Delhi at (Banerjee, S.S., 1951)

Scattering observed at (Banerjee, S. S., 1953)

Horizontal gradients between  $f_oF_2$  at Delhi and (Banerjee, S. S., 1954)

## **BANGUI, AFRICA**

Solar eclipse 25 February 1952 in equatorial Africa, effects on E region at (Estrabaud 1952, 1953)

Ionospheric soundings during eclipse of 25 February 1952 at (Lejay 1956)

## **BENGAL, INDIA (see also DACCA)**

Estimation of height of Heavyside layers in (Rakshit 1931)

## **BIBLIOGRAPHIES (see also SYMPOSIA)**

USSR publications for 1958-60 (AID 1961)

Phenomena in the upper atmosphere: Review of Soviet literature (AID 1963)

Plasma physics and magnetohydrodynamics (Auckland 1962)

Ionospheric height at Allahabad, Tech. Phys. USSR 3 (Bansal 1936)

Ionospheric drifts (Briggs 1962)

Equatorial electrojet (Casaverde 1961)

Backscatter literature survey 1928-1960 (Hagn 1961)

Backscatter literature survey 1960-1963 (Hagn 1964)

The ionosphere 1925-1960 (Manning 1962)

Ionospheric propagation of radio waves 1923-1960 (Nupen 1960)

Atmospheric aspects of radio astronomy 1900-1961 (Nupen 1963)

Theoretical studies of propagation of electromagnetic waves (NYU 1951)



Direction finding and related ionospheric propagation topics  
1955-1961 (Remmler 1962)

Literature pertaining to radio studies of meteors and meteor trails  
(Vincent 1960)

Literature pertaining to VLF and ELF propagation (Whitson 1962)

#### BIFURCATION (see also SOLAR ECLIPSE)

Of F region (Appleton 1946, 1947)

Of presunrise F layer at Calcutta (Bandyopadhyay 1959)

In F region at Baguio (Marasigan 1958)

#### BRISBANE, QUEENSLAND

High multiple reflection from F2 at (Baird 1954)

Nighttime spread F over (Bowman 1960)

Observation of reflections from field-aligned ionization at  
(Dearden 1961, 1962)

Micropulsation studies at (Mainstone 1963)

Observations of field-aligned irregularities at (Matthew 1961, 1962)

Further results of observations of field-aligned irregularities at  
(Matthew 1962)

Characteristics of  $E_{ss}$  and  $E_{sc}$  at (McNicol 1951)

Study of spread F ionospheric echoes at (McNicol 1956, 1957)

Micropulsation studies at (McNicol 1963)

Motion in nighttime  $E_s$  region at (Thomas 1955, 1956)

Sporadic  $E_{ss}$  and  $E_{sc}$  at (Thomas 1956)

Transequatorial backscatter observed at (Thomas 1961)

Observations of transequatorial propagation from (Thomas 1962)

Lack of exospheric propagation of backscatter signals at (Thomas 1962)

Final report on investigations of field-aligned irregularities and  
transequatorial propagation observed at (Thomas 1962)

#### BROADCASTING

On medium wave in tropical and equatorial latitudes (Barghausen 1964)

Sunset fading effects on broadcast circuits (Bennington 1960)

Propagation curves for VHF/UHF in Africa (CCIR 1963)

Sound broadcasting TV (CCIR 1963)

Atmospherics in broadcast reception at Calcutta (Chakravarti 1939)  
 Measurement of atmospheric noise interference (Chandrashekhar, A., 1954, 1956, 1958)  
 Atmospheric noise interference in 3-Mc/s band at Poona (Chandrashekhar, A., 1955)  
 Atmospheric noise interference to short wave (Chandrashekhar, A., 1958)  
 Atmospheric noise interference to medium wave (Chandrashekhar, A., 1958)  
 Noise in standard band at Poona (Chandrashekhar, A., 1959)  
 Vertical radiation and tropical broadcasting (Dickenson 1956)  
 Tropical Receiver design (Lemmon 1941)  
 Propagation of MF radio waves in the ionosphere (Marty 1935)  
 Analysis of Skywave intensity of All India Radio (Mitra, S.N., 1955)  
 Note on ionospheric conditions that may affect tropical broadcasting (Osborne 1952)  
 Atmospheric noise interference in 5-Mc/s band at Poona (Phadke 1955)  
 A peculiar type of rapid fading in All India Radio reception (Rao, N.S., 1949)  
 Polarization of down-coming waves from standard MF stations in India (Satyanarayana 1952)  
 Studies in fading of medium-wave broadcast signals, India (Tantry 1951)

## CALCUTTA, INDIA

Early morning E2 layer at (Bandyopadhyay 1959)  
F-layer of the ionosphere over (Bandyopadhyay 1960)  
Effect of eclipse on ionosphere over (Baral 1944)  
Studies on the ionosphere at (Baral 1948)  
Abnormalities in the F region of the ionosphere at (Baral 1948)  
Ionosphere over (Baral 1950)  
Observations of pulses transmitted from Delhi at (Baral 1952)  
Lunar tide in F2 region over (Baral 1956)  
Ionosphere at (Bhar 1939)  
Effect of magnetic field in oblique propagation at (Chatterjee 1952)  
Ionospheric absorption at (Chatterjee 1952)  
Nature and origin of sporadic E over (Chatterjee 1953)  
E-layer critical frequency at, contaminated with  $E_s$  (Chatterjee 1954)  
Gyrofrequency in ionosphere over (Datta, S., 1959)  
Observations during solar eclipse 1958 at (Datta, S., 1959)  
Studies of spread F, double F and forked F at (Datta, R. N., 1960)  
Determination of F-region collision frequency over (Ghosh, M., 1956)  
Early morning variation of ionization and true height of F region over (Ghosh, S. P., 1940)  
Intensity variations of the downcoming wireless waves from the ionosphere at (Khastgir 1940)  
Solar tides in ionosphere over (Mitra, A. P., 1950, 1951)  
Measurement of ionospheric true heights at, during the polar year 1932-33 (Rakshit 1934)  
E2 layer observed at (Saha, A. K., 1955)

## CANTON, PHOENIX ISLANDS

Stratospheric upper-air studies at (Belmont 1962)

## COHERENT SCATTER

From thin, field-aligned irregularities associated with equatorial spread F as a cause of flutter fading (Calvert 1962)  
Associated with topside spread F (Calvert 1963)

**COLLISION FREQUENCY** (see **ELECTRON COLLISION FREQUENCY**)

**CONDUCTIVITY (IONOSPHERE)**, (see also **ELECTROJET**)

Along magnetic equator (Akasofu 1963)

Of ionosphere (Baker 1952)

Electric currents in ionosphere (Baker 1953 I, II)

Effect of transverse magnetic field on (Banerjee, S.S., 1939)

In dynamo region during daylight as a cause of equatorial  $E_s$   
(Bhargava 1961)

Equatorial electrojet and (Casaverde 1961)

Of D region (Cowling 1948)

Of ionosphere (Cowling 1963)

Influence of Hall current on (Hirono, 1950 I, II)

Magnetic variations in equatorial regions and (Hirono 1952, 1953)

And geomagnetic variations (Lucas 1953)

Daily variations of, in upper atmosphere as deduced from geomagnetism  
(Maeda, H., 1955)

Solar flare type variation in geomagnetic field and (Nagata 1950,  
1952)

**CONTINUOUS WAVE** (see also **DOPPLER TECHNIQUE**)

Study of short-term variations of instantaneous frequencies using  
(Chan 1962)

Short wave transmissions using, as affected by spread F (Krishnamurthy 1963)

Method of studying variation of critical frequency of E region  
using (Rao, B. R., 1954)

Method of studying traveling disturbances using (Rao, B. R. 1954)

New Method for studying ionospheric drift using (Rao, B. R., 1958)

Fading of, as a means of spread F study (Rao, M.S.V.G., 1960)

Effects of equatorial spread F irregularities on (Rao, M.S.V.G., 1961)

Investigation of traveling disturbances at Waltair using (Somayajulu  
1953)

## COSMIC RADIO NOISE

- Study of solar flares with, on 25 Mc/s at Ahmedabad (Bhonsle 1958, 1960)
- Magnetic storms and, at Ahmedabad (Bhonsle 1960)
- Abnormal ionospheric behaviour inferred from study of, at 30 Mc/s in India (Krishnamurthi 1958)
- Measurement of ionospheric absorption using, at 18.3-Mc/s (Mitra, A.P. 1953)
- Absorption of, on 25 Mc/s during solar flare 23 Feb. 1956 at Ahmedabad (Ramanathan 1956)
- Absorption at 25 Mc/s, effect of electron-ion collisions in the F region on, at Ahmedabad (Ramanathan 1961)
- Change in, associated with magnetic storms (Ramanathan 1961)
- Absorption measurements of, during nuclear explosions (Saha 1964)
- Sudden decrease in, cosmic-ray intensity, at Huancayo and Uppsala (Sandstrom 1958)
- Absorption of, and F scatter on 25 Mc/s at Ahmedabad (Shirke 1962)

## CRITICAL FREQUENCIES (see also $f_oF_2$ ; VERTICAL INCIDENCE)

- Horizontal gradients over India deduced from (Banerjee, S.S., 1954)
- Geographical distribution of harmonics of annual variation in, F2-layer at noon (Bazzard 1961)
- And magnetic parameters of the day before (Bergh 1961)
- Lunar variation in, F2, at Singapore (Osborne, B.W., 1952)
- Of normal E layer, measurement at night (Piggott 1955)
- Geomagnetic influence on, over F1 and F2 regions (Rastogi 1959)
- Enhancement of lunar tide in noon value of, over magnetic equator (Rastogi 1961, 1962)
- Enhancement of, after nuclear detonations (Saha 1964)
- Of E layer at Huancayo (Wells 1934)

## **DACCA, BENGAL, INDIA**

Ionospheric height measurements at, by method of signal fading  
(Sen Gunta 1936)

## **DAKAR, SENEGAL**

F-region stratification at Dakar (Delobea 1952)

Lunar tides in F2 layer at (Delobea 1955)

Absorption at (Delobea 1956)

Magnetic field in F2 layer at (Suchy)

## **DELHI, INDIA**

Fading of short-wave signals from (Bannerjee, S. S., 1946, 1948)

Horizontal gradient of ionization at (Bannerjee, S. S., 1954)

Pulses transmitted from, observed at Calcutta (Baral 1952)

Ionospheric F2 layer during sunspot minimum at (Kotadia 1956)

Self-gyrointeraction measured at (Mitra, S.N., 1955)

Magneto-ionic triple splitting over (Mitra, S. N., 1955)

Measurements of ionospheric absorption at (Mitra, S. N., 1957)

Horizontal drift in ionosphere over (Mitra, S. N., 1960)

Ionospheric absorption over (Rao, B.V.T., 1958)

Solar tidal effects in F2 region over (Rao, C.S.R., 1957)

Ionospheric absorption at (Rao, M.K., 1962)

Study of atmospheric radio noise at 27 and 100 kc/s at (Sachdev 1958)

Effects of nuclear detonations observed at (Saha, A. K., 1963, 1964)

Fading at (Singh 1958, 1959, 1960)

F-region gyrofrequency from h'-f records (Singh, R. N., 1962)

Ionogram analysis at (Singh 1963)

Oblique incidence pulse observations near MUF at (Somayajulu 1952)

## **DIFFUSION**

Behavior of a Chapman layer in the night F2 region under the influence  
of gravity, diffusion, and attachment (Duncan 1958)

Convective, in the equatorial F region (Dungey 1956)

## DIFFUSION (Continued)

- Of electrons near magnetic equator (Ferraro 1960)
- Horizontal, into an eclipsed equatorial F2 region (Gliddon 1962)
- Effect of, on equilibrium electron density distribution in F region near magnetic equator (Goldberg 1962, '963)
- General, in symposium on dynamic ionosphere (Johnson, M. H., 1950)
- Geomagnetic control of, in the F2 region (Kendall 1962)
- Horizontal, and the geomagnetic anomaly (Lyon 1962)
- Of ionization in a dipole field (Lyon 1963)
- Discussion of (Martyn 1950)
- Theory of height and ionization density changes at the maximum of a Chapman-like region, taking account of (Martyn 1955)
- Discussed in symposium (McNish 1950)
- In equatorial F layer (Rishbeth 1962, 1963)
- Vertical, and distribution of ionization about magnetic equator (Ross 1963)
- Effects of vertical, near magnetic equator (Schmerling 1960)
- Horizontal, evidence on F-region ionization diffusion along magnetic lines of force in equatorial latitudes (Somayajulu 1964)

## DIRECTION FINDING

- Using rotating spaced loops (Bowman 1960)
- Studying tilts by (Bramley 1955)
- Bibliography on (Remmler 1962)

## DISTURBANCE DAILY VARIATION

- In Ghana (Hutton 1962, 1963)
- Latitudinal effect on, in F2 layer (Kamiyama 1956)
- Of earth currents at Kakioka (Kazuo 1954)
- On the magnetic equator, lower daily variations in F2 region (Maeda, H., 1955, 1959)
- F2 layer index of, for IGY (Piggott 1960)
- In Central Africa, storm time variations of  $f_oF2$  (Rastogi 1961)
- In F2 region at auroral latitudes (Sato 1957)

## DIVERSITY

Space diversity and reception of fading signals (Bannerjee, S.S., 1946, 1948)

## DOPPLER TECHNIQUE

Study of radio propagation characteristics of the equatorial ionosphere using (Barghausen 1963)

At VHF to observe drift (Bowles 1960)

For study of equatorial flutter fading (Calvert 1962)

And equatorial spread F (Calvert 1962)

Equatorial spread F motions observed by (Calvert 1963)

A study of F2-layer effects using (Davies 1962)

Measurements of ionospheric drifts using (Davies 1962)

For studying solar flare effects (Davies 1962)

Over Wallops Island (Jackson 1961)

Electron content from satellite by (Ross 1960, 1961, 1962)

## D REGION (D LAYER)

On the lunar semidiurnal variation of (Bossolasco 1960)

Echoes at D-region heights (Ellyett 1947)

Echoes observed (Gnanalingam, 1955)

Ionospheric cross-modulation in, at the geomagnetic equator (Klemperer 1963)

Twenty-seven-day variations in absorption in, over Singapore and Slough (Lange-Hesse 1953)

Structure of, and probable origin (Lepechinsky 1955)

## DRIFTS, IONOSPHERIC

Velocity over Calcutta (Baral 1956)

Measurements at Kjello (Becken 1960)

F2 disturbances during magnetic storms analyzed in terms of vertical drifts (Bhargava 1959)

Velocity determined by MUF (Bibl 1963)

Of  $E_s$  (Bossolasco 1959)



## DRIFTS, IONOSPHERIC (Continued)

- Equatorial, determined by Doppler technique (Bowles 1960)
- Fading due to (Briggs 1950)
- Horizontal movements (Briggs 1954)
- Survey of (Briggs 1962)
- Of equatorial spread F (Calvert 1961)
- Velocity of, for equatorial spread F (Calvert 1963)
- Measurement of, by means of Doppler shift technique (Davies 1962)
- Measurement of, by radio star observations (Dueño 1961)
- And semidiurnal currents in the ionosphere (Fejer 1953)
- Seasonal variation of, in E region (Henderson 1962, 1963)
- In E region (Hirono 1953)
- Vertical, effect of gravity and ionization pressure gradient on, in F2 region (Hirono 1954, 1955)
- Wind systems and, deduced from dynamo theory (Hirono 1959)
- Latitude variation of midday direction of, in lower ionosphere (Kazimirovskiy 1963)
- Possibility of detecting, from occurrence of spread F (Knecht 1960)
- Vertical, at Huancayo (Lewis 1953)
- Theoretical study on the geomagnetic distortion in the F2 layer interpreted by (Maeda, K., 1952, 1955)
- New method for estimating loss and drift terms in F region (Mitra, A. P., 1964)
- Horizontal, over Delhi (Mitra, S. N., 1960)
- Horizontal motions of ionization in equatorial F region (Osborne, B. W., 1955)
- Equatorial, and the electrojet (Osborne, D. G., 1963)
- In equatorial F2 region (Purslow, B. W., 1958)
- Horizontal, lunar daily variation of, at Waltair (Ramana 1962)
- In E, F2 regions at Waltair (Rao, A. S., 1963, 1964)
- And on ionospheric wind measurements (Rao, B. R., 1954, 1956)
- Effect of enhanced solar activity on, in F2 region at Waltair (Rao, B. R., 1958)
- Horizontal, in F2 region at equatorial latitudes (Rao, B. R., 1958)
- A new continuous wave method of studying (Rao, B. R., 1958)

## DRIFTS, IONOSPHERIC (Continued)

- Study of horizontal, in F1 and F2 regions at Waltair (Rao, B. R., 1959)
- Effect of magnetic activity on, in F2 region (Rao, B. R., 1959)
- A new type of ionospheric drift recorder (Rao, B. R., 1961)
- Variation of, at Waltair (Rao, E. B., 1961)
- Simultaneous study of (Rao, E. B., 1961)
- In the ionosphere in relation to fading (Rao, E. B., 1961)
- World-wide study of horizontal (Rao, G. L. N., 1963, 1964)
- Effect of vertical drift on nocturnal ionization of lower ionosphere (Rao, M. N., 1959)
- Study of horizontal, in E region at Waltair (Rao, R. R., 1960, 1961)
- Height gradient of horizontal drifts in E region at Waltair (Rao, R. R., 1961)
- F2 disturbances in auroral latitudes ascribed to (Sato 1957)
- Horizontal, comparison at different latitudes (Shimazaki 1960)
- Spread F and vertical movement of F layer (Singleton 1962)
- In F2 layer related to electrojet (Skinner 1957)
- Horizontal, measurements in ionosphere near equator (Skinner 1958)
- Measurements of, in the equatorial region (Skinner 1963)
- Vertical, at Talara and Huancayo (Somayajulu 1963)
- Observation and analysis of (Yerg 1956)

## DYNAMO THEORY

- E-layer conductivity and (Baker 1952, 1953)
- And Ionosphere conductivity (Cowling 1948, 1963)
- Some comments on (Dougherty 1963)
- Electrostatic fields in the ionosphere at non-polar geomagnetic latitudes (Farley 1960)
- Differential equations of, solved (Fejer 1953)
- Theory of diurnal magnetic variations in equatorial regions and conductivity of the ionosphere E region (Hirono 1950, 1952, 1953)
- Wind systems and drift motions in the ionosphere deduced from (Hirono 1959)
- Related to S<sub>D</sub> current system (Matsushita 1954)

**DYNAMO THEORY (Continued)**

Solar-flare-type variation in geomagnetic field and integrated electro-conductivity of ionosphere (Nagata 1950, 1952)

Sudden commencement of magnetic storms and (Obayashi 1957)

Disturbances in F2 region associated with geomagnetic storms at auroral latitudes (Sato 1957)

Disturbances in F2 region associated with geomagnetic storms at mid-latitudes (Sato 1957)

Theory of electrostatic fields in the ionosphere at equatorial latitudes (Spreiter 1961)

Of diurnal variation of Earth's magnetic field (Wells 1934)

## EARTH CURRENTS

- And micropulsations at the equator (Hutton 1960)
- Diurnal variation of, at the equator (Hutton 1961, 1962)
- S variation of, near magnetic equator (Hutton 1963)
- Lunar diurnal variations in, at Huancayo and Tucson (Rooney 1938)

## ECHOES

- Recording ionospheric (Bajpai, R. R., 1936)
- From stratified region above equatorial electrojet (Balsley 1964)
- Examination of, for Delhi-Calcutta path (Baral 1952)
- From field-aligned ionization (Bowles 1960)
- At D-region heights (Ellyett 1947)
- From D region (Gnanalingam 1955)
- Lefthanded, from an equivalent height of E + F (Khastgir 1960)
- Multiple, in Bengal (Mitra, S. K., 1933)
- Spread, study of (Renau 1959)

## ECLIPSE (see also SOLAR ECLIPSE)

- Effect of, on ionosphere over Calcutta (Baral 1944)
- Photochemical rates in the equatorial F2 region from, of 1958 (Van Zandt 1960)
- Effects in F2 layer (Wells 1946)

## E LAYER (see E REGION; E1 LAYER; E2 LAYER; SPORADIC E)

### E1 LAYER

- Origin of (Bhar 1938)
- Over Calcutta (Bhar 1939)
- At low latitudes (Ben' Kova 1963)

## E2 LAYER

Morning, at Calcutta (Bandyopadhyay 1955)

Intermediate layers between E and F1 over Ahmedabad (Rastogi 1954)

Two types of development of, at Ahmedabad (Rastogi 1965)

Observed at Calcutta (Saha, A. K., 1955)

## ELECTROJET, EQUATORIAL (see also ELECTROJET, POLAR; SPORADIC E)

Enhancement of, during polar magnetic substorms (Akasofu 1963)

Width of (Alexander 1957)

High conductivity along equator (Ashour 1964)

Anomalously large magnetic variations near equator (Baker 1952, 1953)

Echoes above (Balsley 1964)

Effect of  $E_s$  on (Baral 1952)

Related to  $E_s$  (Bhargava 1961)

Fading of VHF,  $E_s$ , and sporadic E (Bowles 1960)

As cause of field-aligned irregularities (Bowles 1963)

Introduction to geomagnetism (Casaverde 1961)

As detected from the abnormal electric distribution above Hyancayo (Chapman 1951)

Association of plane-wave electron density irregularities with (Cohen 1963)

Magneto hydrodynamics (Ferraro 1955)

In Peru (Forbush 1961)

Recent magnetic observations in the Philippines (Glover 1963)

Diurnal variation of earth currents at the equator (Hutton 1961, 1962)

Equatorial enhancement of sudden commencement of geomagnetic storms due to (Jacobs 1963)

Suggestion as to origin of (Knapp 1959)

Theory of field-aligned ionization in (Knox 1964)

Equatorial sporadic E layer and (Kotadia 1962)

In the central Pacific (Mason 1963)

Magnetic activity and (Mryaud 1963)

Measurements of magnetic field of (Ogbuehi 1963)

Experimental study and model of (Onwumechilli 1959)

## **ELECTROJET, EQUATORIAL (Continued)**

Relation between H and Z variations near ( Onwumechilli 1960)  
Anomaly in magnetic declination at Ibadan related to  
(Onwumechilli 1960)  
In Ghana (Osborne, D. G., 1962)  
Position and movement of over Ghana (Osborne, D. G., 1962)  
Equatorial drift and (Osborne, D. G., 1963)  
Daily variation in strength of (Osborne, D. G., 1963)  
Effect of, on seasonal variation of sporadic E (Rao, M. M., 1963)  
Nocturnal and seasonal variations of spread F in relation to  
(Rao, M. S. V. G., 1961)  
Longitudinal variation in (Rastogi 1962)  
Lunar tidal variations in (Rastogi 1963)  
Effect on sporadic E and F2 layers (Skinner 1957)  
Theory of, at equatorial latitudes (Spreiter 1961)  
Reflected by solar flare effects (Veldkamp 1954)  
Theory of equatorial sporadic E and (Whitehead 1963)  
Effects of magnetic disturbances on (Wright, R. W., 1962)  
Ionospheric electrostatic fields and (Zmuda 1960)

## **ELECTROJET, POLAR (see also ELECTROJET, EQUATORIAL)**

The electrojets (Chapman 1953)  
Theory of (Fejer 1963)  
Geomagnetic field distortion by a solar stream as a mechanism  
for production of (Kern 1961, 1962)  
Observations relating to distance scale for motion of electrojet-  
electron precipitation regions in auroral zone (Marsh 1963)  
Ionospheric disturbances associated with a severe magnetic storm  
and (Obayashi 1958)  
Theory of, at polar and mid-geomagnetic latitudes (Spreiter 1961)  
Note on direction of high auroral arcs (Vestine 1960)

## **ELECTRON COLLISION FREQUENCY**

- Technique to determine (Briggs 1951)
- In ionosphere (Cook 1961)
- At E peak over Dakar (Delobean 1956)
- And the interaction of pulsed radio waves in the ionosphere (Fejer 1955)
- Determination of, in the F-region over Calcutta (Ghosh, M., 1956)
- An experimental method of measuring, for F region (Hargreaves 1963)
- Measurements of, in E region (Schlapp 1959)
- An attempt to measure, in F region (Schlapp 1960)
- Effect of collisions on ionospheric propagation (Titheridge 1961)

## **ELECTRON DENSITY**

- Total, and anomalies (Altman 1963)
- Equatorial, in F2 layer (Appleton 1954)
- In the F layer of the ionosphere (Bandyopadhyay 1960)
- Near Delhi and Calcutta (Banerjee 1946)
- Cause and effect in the F2 region (Bannon 1946)
- Effect of meteoric shower on (Bhar 1937)
- From Faraday fading (Blackband 1960)
- Studies of the electron content of the equatorial ionosphere (Blumle 1961, 1962)
- Equatorial profiles to 5000 kms (Bowles 1962)
- Over the magnetic equator (Bowles 1962)
- Diurnal variation of F2 layer, at equatorial stations (Eyfrig 1950)
- The effect of diffusion on, in the F region (Goldberg 1962)
- Distribution near the magnetic equator (Goldberg 1962)
- Geomagnetic control of, in F region of ionosphere (Goldberg 1963)
- Effect of diffusion on, in F region near magnetic equator (Goldberg 1963)
- Analysis of, at Leopoldville-Binza (Herrinck 1960)
- Mean temporal variations of, at a fixed height in the F region (Hirsh 1962)
- F2-layer, and solar corpuscular activity (Lal 1963)
- Determination of the available frequency range considering (Lied 1947)

## **ELECTRON DENSITY (Continued)**

- Distribution of electrons in the night-time ionosphere (Long 1962)
- In F2 layer, world-wide distribution of (Mariani 1959)
- Direct measurement of, in a satellite up to one earth radius (McInerney 1964)
- F-region, from circuit measurements (Nisbet 1960)
- Practical determination of electron content below  $N_{\text{max}}$  (Osborne, B. W., 1952)
- Electron content of F2 layer above Singapore (Osborne, B. W., 1953)
- Distribution in ionosphere over Trivandrum (Rao, C. S. R., 1961)
- Studies of the geomagnetic anomaly during sunspot minimum (Rao, C. S. R., 1962)
- Total electronic content in F2 layer over Madras, 1959 (Rao, C. S. R., 1962)
- Distribution of ionization about magnetic equator (Ross 1963)
- Diurnal and annual variation of equatorial electron content (Ross 1963)
- At Washington, D.C., Panama, Talara, and Huancayo (Schmerling 1958, 1959, 1960)
- In E layer over Bengal (Sen Gupta 1936)
- Total electron content of F region over Ahmedabad (Sheriff 1956)
- Profiles, comparison for low and high solar activity, in Ahmedabad (Shirke 1963)
- Spread F and F layer (Singleton 1962)
- Some features of F-region density and height variation in equatorial region (Somayaajulu 1963)
- Ionization below nighttime F layer (Titheridge 1959)
- Ionization of Kennelly-Heavyside layer at Allahabad (Toshnival 1935, 1936)
- Analysis of vertical sounding to determine profiles (Wright, J. W., 1959, 1960, 1962, 1963)
- On variations of, in middle latitude F2 layer (Yonezawa 1959)

**EMISSION (see AIRGLOW)**

**EQUATORIAL ANOMALY (see ANOMALIES)**



**EQUATORIAL IONOSPHERE (see also TRANSEQUATORIAL)**

- Anomalous belt in F2 (Appleton 1954)
- Anomalies in F2 layer (Appleton 1960)
- Geomagnetic nature of F2-layer longitude effect (Bailey 1948)
- Propagation experiment (Barghausen 1962)
- HF propagation characteristics in equatorial latitudes (Barghausen 1963, 1964)
- Magnetic field (Ben 'Kova 1962)
- E layer (Ben 'Kova 1963)
- Ionospheric effects (Bennington 1960)
- Airglow observations near (Blackwell 1960)
- Satellite observations of (Blumle 1961, 1962)
- NBS VHF scatter research (Bowles 1957)
- Ionospheric scattering phenomena (Bowles 1959, 1960, 1962, 1963)
- Differs from mid-latitudes (Bukin 1961)
- Special problems in using HF reflections from (CCIR 1963)
- Diurnal variations of earth currents associated with Hutton 1961, 1962, 1963)
- Equatorial spread F (Lyon 1958, 1960, 1961)
- F2 region during sunspot maximum (Lyon 1963)
- The equatorial F region (Norton 1961)
- A waveguide interpretation of spread F in (Pitteway 1961)
- Trough found in theoretical form of F layer, near magnetic equator (Rishbeth 1963)
- Research engineering and support for tropical communication (Vincent 1963)
- Equatorial spread F (Wright, R. W., 1959)

**EQUATORIAL  $E_s$  (see SPORADIC E)**

**EQUATORIAL TROUGH (see ANOMALIES)**

#### **EQUIPMENT (see also ANTENNAS)**

- Polarimeter for LF echoes (Benner 1950)**
- Sweep-frequency instruments for studying irregularities (Briggs 1951)**
- Low-power ionosonde (Busch 1963)**
- Rotating aerial backscatter sounder (Clemesha 1962)**
- A panoramic ionospheric recorder for study of ionospheric traveling disturbances (Heisler 1955)**
- Tropical receiver design (Lemmon 1941)**
- A modified Hammerlund Super-Pro communication receiver for pulse measurements of the ionosphere (Mitra, S. N., 1951)**
- Peak amplitude recorder for investigation of fading (Mazumdar 1954)**
- Design and development of simple ionospheric sounding equipment (Murty 1956)**
- A new type of ionospheric drift recorder (Rao, B. R., 1961)**
- The vector-field proton magnetometer for IGY satellite ground stations (Shapiro 1967)**
- Instrumentation for observation of field-aligned F-region irregularities and transequatorial radio propagation (Thomas 1962)**
- Tests of HF transceivers for use in a tropical forest (Vincent 1963)**
- Detection of rapidly moving ionospheric clouds (Wells 1946)**

#### **E REGION (see also E1 LAYER; E2 LAYER; Sq CURRENT; SPORADIC E)**

- Sq current systems and (Appleton 1955)**
- Studies of (Appleton 1961)**
- At low latitudes (Ben 'Kova 1963)**
- Abnormal ionization of (Berkner 1937)**
- Geomagnetic distortion of (Beynon 1959)**
- Variation of height of F2 peak due to nighttime E layer (Bonnet 1954)**
- Field-aligned irregularities in (Bowles 1963)**
- Solar control of, at high latitudes (Chatterjee 1954)**
- Transient fine structure of (Dieminger 1959)**
- Influence of solar eclipse 25 February 1952 on, in equatorial Africa (Estrabaud 1953)**
- Seasonal and latitude variations of drifts in (Henderson 1962, 1963)**
- Magnetic variations in equatorial regions and conductivity of (Hirono 1952, 1953)**

## **E REGION (Continued)**

- Reflection and transmission in (Khastgir 1960)
- Measurement of normal critical frequencies at night (Piggott 1955)
- A continuous-wave method of studying critical frequency variation of (Rao, B. R., 1954)
- World-wide study of horizontal drift and anisotropy of irregularities in (Rao, G. L. N., 1963)
- Horizontal drifts in, at Waltair (Rao, R. R., 1960, 1961a)
- Height gradient of horizontal drift in, over Waltair (Rao, R. R., 1961b)
- Study of noon critical frequencies of (Rastogi 1957, 1958)
- Intermediate layers between E and F1 over Ahmedabad (Rastogi 1954)
- Measurements of collision frequency in (Schlapp 1959)
- Effect of Sq current system on (Shimazaki 1959)
- Critical frequency observations at Huancayo (Wells 1934)

**E<sub>s</sub>** (see SPORADIC E)

## **EXOSPHERE**

- Symposium on (Hines 1960)
- Propagation experiments in, at Brisbane (Thomas 1962)
- A possibility of long-distance HF propagation along field-aligned ionizations in (Obayashi 1959)

## **EXTRAORDINARY RAY**

- Use of, in analysis of ionospheric records, to study region between E and F (Titheridge 1959)

**FADING (see also FLUTTER FADING)**

- Correlation between frequency-selective fading and multipath (Ames 1963)
- Correlation bandwidth, for transauroral path (Auterman 1962)
- Of radio waves reflected from ionosphere at oblique incidence (Awe 1961)
- Of radio waves weakly scattered at 90 km vertical incidence (Awe 1961)
- Slow fading of echo at 150 km near equator (Balsley 1964)
- Space diversity and (Bannerjee, S. S., 1946, 1948)
- Periodic or rhythmic (Bannerjee, S. S., 1948)
- Equatorial ionospheric effects (Bennington 1960)
- Rate of VHF fading, equatorial electrojet and  $E_s$  (Bowles 1960)
- Analysis of observations on spaced receivers (Briggs 1950)
- Allowances for, in tropical broadcasting (CCIR 1963)
- Statistical analysis of, for a single downcoming wave (Das Gupta, P., 1960)
- Of ionospheric signals (Flood 1954)
- Correlation analysis of vertically reflected radio waves (Fooks 1961)
- HF Non-reciprocity and polarization fading (Jull 1962)
- Of 108-Mc/s wave from satellite observed at equatorial station (Kent 1961)
- Of downcoming wireless waves from the ionosphere (Khastgir 1940)
- Random motions of ionosphere irregularities and (Mitra, S. N., 1957)
- Random, horizontal drifts in relation to (Rao, E. B., 1961)
- Long-period fading in medium radio signals at Waltair (Rao, M. S., 1955)
- Investigation of magneto-ionic fading in oblique incidence wave transmissions (Rao, M. S., 1958)
- Of CW signals, as a means of spread-F study (Rao, M.S.V., 1960)
- Rapid, peculiar type of, in radio reception (Rao, N.S.S., 1949)
- Diffraction from ionosphere and (Ratcliffe 1948)
- Historical survey of, at MF and HF (Salaman 1962)
- Ionospheric height measurements in eastern Bengal by method of (Sen Gupta 1936)
- Rates of fading of reflected pulses, vertically incident at Ahmedabad (Sethuraman 1958)

#### FADING (Continued)

- On long-distance oblique-incidence pulse circuit on 20.1 Mc/s (Silberstein 1958)
- Periodic, particular type of (Singh, B. N., 1958)
- Rhythmic, of short-wave radio signals (Singh, B. N., 1959)
- Variation of rate of, with frequency (Singh, B. N., 1960)
- Effect of radio "fade-out" on F2 layer (Suryanarayana 1962)
- Rapid frequency analysis of fading radio signals (Watts 1960)
- New type of, on transequatorial circuits (Yeh 1958)
- Attenuation of HF waves propagated over long paths crossing auroral, temperate, and equatorial zones (Yeh 1960)

#### FARADAY EFFECT (see also SATELLITE)

- Data used to infer scale height (Bauer 1960)
- Determination of electron content (Blackband 1960)
- On satellite radio transmissions (Blumle 1961)
- From satellite observations of the equatorial ionosphere (Blumle 1962)
- And its applications (Daniels 1959)
- Near the transverse region of the ionosphere (Dulk 1963)
- Effect of, on incoherent backscatter (Millman 1961)
- Second-order Faraday rotation formulas (Yeh 1960)

#### FIELD-ALIGNED IRREGULARITIES (see also IRREGULARITIES; SPORADIC E)

- Radio echoes from near magnetic equator (Bowles 1960)
- Identified with acoustic plasma waves (Bowles 1963)
- Equatorial spread F and (Calvert 1961)
- Doppler studies of (Calvert 1962)
- Evidence for, between 400 and 1000 km (Calvert 1963)
- Observed on topside sounder (Calvert 1963)
- Geometry of radio reflections from (Dearden 1961)
- Echoes from, observed at Brisbane (Dearden 1962)
- Anisotropic, near the magnetic equator (Egan 1960)
- Plasma instability resulting in (Farley 1963)
- In the E<sub>s</sub> region (Goodwin 1962, 1963)

#### **FIELD-ALIGNED IRREGULARITIES (Continued)**

Radio echoes from, at magnetic equator (Ireland 1962)  
Survey of observations of, from Brisbane (Matthew 1961)  
Further results of observations of, from Brisbane (Matthew 1962)  
Radar observations of, during magnetically disturbed days (Matthew 1962)  
Field-aligned irregularities (Ratcliffe 1963)  
Scintillation of satellite transmissions and (Singleton 1961)  
Irregularities, final report (Thomas 1962)  
Instrumentation for observation of (Thomas 1962)

#### **FIELD STRENGTH**

Calculation for tropical broadcasting (CCIR 1963)  
Measurements over path Tripoli-Accra (Davies 1962)  
Calculation of, at HF (Laitinen 1950)  
Analysis of sky-wave field intensity (Mitra, S. N., 1955)  
Calculation of median sky-wave in tropical regions (Piggott 1959)  
Related to atmospheric humidity (Rao, N.S.S., 1950)  
Measurements of, during solar eclipses at Ahmedabad (Rastogi 1955, 1956)  
Longwave, effects from distant nuclear detonation (Saha 1964)

#### **F LAYER (see also F1 LAYER; F2 REGION)**

Relation to anomaly in total content (Altman 1963)  
A study of (Bajpai 1938)  
Further studies of, at Allahabad (Bajpai 1939)  
Decay of ionization below, at night (Bandyopadhyay 1961)  
Observations of spread echoes from (Bhargava, B. N., 1958)  
Scattering of radio waves by (Booker 1938)  
Phenomena of, at Tsumeb, South West Africa (Dieminger 1960)  
Convective diffusion in, equatorial (Dungey 1956)  
Gyrofrequency in, over Hobart, Tasmania (Ellis 1957)  
Theories of (Fejer 1963)



## F LAYER (Continued)

- Early-morning variation of ionization of true height of (Ghosh, S. P., 1940)
- Effect of diffusion on equilibrium electron-density distribution in, near the magnetic equator (Goldberg 1962, 1963)
- Method of estimating collision frequencies in (Hargreaves 1963)
- Mean temporal variations of electron density at fixed height in (Hirsh 1962)
- Height of nighttime irregularities in, at equator (Kent 1961)
- Equatorial study of irregularities in (Kent 1963)
- The size of moving irregularities in (Khastgir 1960)
- Solar effects in (Knecht 1962)
- Effect of magnetic activity and F-region height change on equatorial spread F (Krishnamurthy 1963)
- Bifurcation in, at Baguio (Marasigan 1958)
- Lunar tidal variations in, near magnetic equator (Martyn 1947)
- Latitude effect of oxygen red line of night air glow and its relation with (Nakamura 1961)
- Electron density in, from rocket measurements (Nisbet 1960)
- Horizontal movements of ionization in, equatorial (Osborne, B. W., 1955)
- Studies of, equatorial (Rao, B. C. N., 1962)
- Traveling disturbances in (Rao, E. B., 1961)
- Correlation of spread-F activity with (Rao, M.S.V.G., 1960)
- Rates of production and loss of electrons in (Ratcliffe 1956)
- Theory of (Ratcliffe 1963)
- Diffusion in, equatorial (Rishbeth 1963)
- An attempt to measure collision frequency in (Schlapp 1960)
- Total electron content of, over Ahmedabad (Sheriff 1956)
- Scatter in, and cosmic radio noise on 25 Mc/s at Ahmedabad (Shirke 1962)
- Magnetic field of, from h'f records (Singh, R. N., 1962)
- Spread F and parameters of (Singleton 1962)
- Multiple stratifications of, at Ibadan (Skinner 1954)
- Evidence on horizontal diffusion along magnetic lines of force in, equatorial (Somayajulu 1964)
- Ionization below, at night (Titheridge 1959)

## F LAYER (Continued)

Seasonal anomaly of (Wright, J. W., 1963)

## F1 LAYER

Small (5%) diurnal variation of  $f_oF_1$  and virtual height of, at Huancayo (Berkner 1934)

Solar control of, at high latitudes (Chatterjee 1954)

Stratification of, at Dakar, French West Africa (Delobea 1952)

Effect of geomagnetism on (Eyfrig 1955)

Global characteristics of separation between F1 and F2 layers (Ghosh, M. 1953)

Study of horizontal drifts in F1 and F2 regions at Waltair (Rao, B. R., 1959)

Diurnal variations of (Rao, E. B., 1961)

Intermediate layers between E and F1 over Ahmedabad (Rastogi 1954)

Geomagnetic influences on, at different stages of solar activity (Rastogi 1959)

Effect of Sq current system on (Shimazaki 1959)

## F 1.5 LAYER (see also ECLIPSE)

At Dakar, and motion of sun (Delobea 1952, 1954)

Eclipse effect on F region in equatorial Africa (Estrabaud 1952)

Discussion on the F 1.5 layer of the ionosphere (Kotadia 1957, 1963)

Comparison of results of ionospheric soundings in equatorial Africa (Lejay 1956)

Eclipse effect in the F2 layer (Wells 1946)

## F2 LAYER (see F2 REGION)

## FLUTTER FADING (see also FADING; SPREAD F)

Rise of F layer at sunset (Appleton 1960)

Equatorial ionosphere propagation experiment (Barghausen 1962)

Study of radio propagation characteristics in equatorial ionosphere (Barghausen 1963)



## FLUTTER FADING (Continued)

- HF propagation characteristics in equatorial latitudes (Barghausen 1963)
- HF propagation via equatorial ionosphere (Barghausen 1964)
- Equatorial ionospheric effects: post-sunset fading on long-distance radio circuits (Bennington 1960)
- Variations in fading over UK/Singapore and UK/Johannesburg broadcast circuits (Bennington 1960)
- Caused by equatorial spread F (Calvert 1962)
- Equatorial sunset effect (Humby 1959)
- Measurements on sunset fading effect (Koster 1963)
- Time of onset of spread F in relation to post-sunset HF variations (Krishnamurthy 1963)
- Connection with spread echoes, magnetic storms, and the radiation belt (Lal 1960)
- Ionospheric conditions that may affect tropical broadcasting services after sunset (Osborne, B. W., 1952)
- Post-sunset rise of  $f_oF_2$  and dependence on post-sunset rise of H'F (Rao, B.C.N., 1963)
- Equatorial spread F, in relation to post-sunset changes in magnetic activity (Rao, M.S.V.G., 1961)
- Peculiar type of rapid fading (Rao, N.S.S., 1949)
- Observation at VHF (Southworth 1960)
- Equatorial flutter-fading observations (Stiltner 1963)
- Relation to equatorial spread F (Wright, R. W., 1959)

## F2 REGION

- Diurnal variations in (Allen 1953)
- Studies of (Appleton 1950)
- Morphology of ionospheric storms in (Appleton 1952)
- Anomalous equatorial belt in (Appleton 1954)
- Anomalies in F2 layer of (Appleton 1960)
- Geomagnetic nature of (Briley 1948)
- High multiple radio reflections from (Baird 1954)
- Recording ionospheric echoes from (Bajpai 1936)

## F2 REGION (Continued)

- A study of diurnal variation of critical frequencies of (Bajpai 1938)
- Studies of, at Allahabad (Bajpai 1939)
- Electron distribution in (Bandyopadhyay 1960)
- Cause and effect in (Bannon 1946)
- Abnormalities in (Baral 1948)
- Lunar tidal variations in (Baral 1956)
- Twenty-seven-day variations in, at Huancayo (Bartels 1950)
- IGY observations in, Far East (Batemen 1959)
- Variation in the critical frequency of (Bazzard 1961)
- Drift measurements in, at Kjeller (Becken 1960)
- And ionospheric critical frequencies (Bergh 1961)
- And time lag between magnetic and ionospheric change (Bergh 1962)
- And ionosphere investigation (Berkner 1934)
- Ionization in, and magnetic dip (Bhar 1957)
- A study of noon ionization in (Bhar 1959)
- Annual wave in (Bhargava, B. N., 1959)
- Distortion of, in the equatorial ionosphere (Bhargava, B. N., 1962)
- Fluctuation of ionization in (Bibl 1963)
- Peculiarity in, at Lwiro (Bonnett 1954)
- Lunar semidiurnal variations of (Bossolasco 1960)
- Variations in ionospheric characteristics of (Briggs 1958)
- Lunar variations of (Brown, R. A., 1956)
- Studies of height oscillations in (Burkard 1950)
- Electron annihilation in (Burkard 1950)
- Studies of ionospheric tidal effect in (Burkard 1951)
- Comments on geomagnetic effect in (Burkard 1954)
- Instability of, equatorial F-layer after sunset (Calvert 1963)
- Geomagnetic time variations (Chakrabarty 1946)
- Vertical transport of electrons in (Chandra 1960)
- Ionization distribution in (Chatterjee 1954)
- Regularities in (Chatterjee 1954)
- Backscattering of radio waves from, equatorial (Clemesha 1963)

## F2 REGION (Continued)

- Anomalies in behavior of (Croom 1959)
- Ionospheric observations during April 19, 1958 eclipse (Datta, S., 1959)
- Study of, with Doppler technique (Davies 1962)
- The equatorial (Duncan 1960)
- Effects of 25 February 1952, solar eclipse on, in equatorial Africa (Estrabaud 1952)
- Diurnal variation of electron density of, at equatorial stations (Eyfrig 1950)
- On height of (Eyfrig 1952, 1956)
- Equator of (Eyfrig 1962)
- Effect of magnetic declination on (Eyfrig 1963)
- Lunar stratification of, at Huancayo (Gautier 1951)
- Determination of collision frequency in (Ghosh, M., 1956)
- Theoretical world curves of maximum ionization of (Gliddon 1961)
- Mathematical model of (Gliddon 1962)
- On ionization of (Goodall 1937)
- The solar cycle and (Goodall 1939)
- Geomagnetic distortion in, its nature and origin (Hasegawa 1954)
- Interpretation of F2 critical frequency measurements of (Heisler 1961)
- Analysis of electron density of, at Leopoldville-Binza (Herrinck 1960)
- Symposium on (Hines 1960)
- Geomagnetic distortion of, on the magnetic equator (Hirono 1954)
- Effect of gravity and ionization pressure gradient in the vertical drift in (Hirono 1955)
- Characteristics of, on the magnetic equator (Hirono 1955)
- Geomagnetic distortion of, on the magnetic equator (Hirono 1955)
- The latitudinal effect on the disturbance daily variation in (Kamiyama 1956)
- During sunspot minimum over Ahmedabad, Delhi, and Tiruchirapalli (Kotadia 1956)
- Lunar tidal variations of midday critical frequencies of, in low latitudes (Kotadia 1962)
- Magnetic storm of 11 February 1958 and associated changes in, at low latitude (Kotadia 1962)

## F2 REGION (Continued)

- During eclipse, at Huancayo (Ledig 1946)
- Vertical movement of, at Huancayo (Lewis 1953)
- Ionization of, and geomagnetic latitude (Liang 1947)
- Horizontal diffusion and the geomagnetic anomaly in (Lyon 1962)
- Equatorial anomaly in, during sunspot maximum (Lyon 1963)
- Disturbance, daily variation and the lunar daily variation in, on magnetic equator (Maeda, H., 1955)
- Geomagnetic distortion of, on magnetic equator (Maeda, H., 1959)
- Variation of, associated with geomagnetic variation (Maeda, K., 1952)
- Theoretical study on the geomagnetic distortion in (Maeda, K., 1955)
- Geomagnetic distortion in (Maeda, K., 1955)
- Geomagnetic anomalies of, and their interpretation (Martyn 1955)
- A survey of some problems concerning (Martyn 1962)
- Variations of, associated with geomagnetic disturbances at the equatorial zone (Matsushita 1955)
- Graphical representation of longitudinal effect in (Minnis 1952)
- Geographical distribution of ionization in (Minnis 1960)
- Geomagnetic control of (Mitra, S. K., 1946)
- Ionospheric behavior in F2 region in Singapore (Osborne, B. W., 1951, 1955)
- Lunar variation of  $f_oF_2$  in, at Singapore (Osborne, B. W., 1952)
- Practical determination of electron content below  $N_{max}$  in (Osborne, B. W., 1952)
- Electron content of, above Singapore (Osborne, B. W., 1953)
- Daily index of F2-layer disturbance during IGY (Piggott 1960)
- A wave-guide interpretation of, for spread F on equatorial ionograms (Pitteway 1961)
- Ionospheric drift in, near magnetic equator (Purslow 1958)
- Horizontal drifts in, at Waltair (Rao, A. S., 1963)
- Effects of enhanced solar activity on drifts in, at Waltair (Rao, B. R., 1958)
- Horizontal ionospheric drifts in, at equatorial latitudes (Rao, B. R., 1958)
- Solar tidal effects in, over Delhi (Rao, C.S.R., 1957)
- Total electron content in, over Madras 1959 (Rao, C.S.R., 1961)

F2 REGION (Continued)

- Study of geomagnetic anomaly in, during sunspot maximum (Rao, C.S.R., 1962)
- World-wide study of horizontal drift in (Rao, G.L.N., 1964)
- Geomagnetic influences on, at different states of solar activity (Rastogi 1956)
- Type of development of, at Ahmedabad (Rastogi 1956)
- Asymmetry between hemispheres in (Rastogi 1960)
- A synoptic study of, in Asian zone (Rastogi 1960)
- Some effects of geomagnetic activity on (Rastogi 1961)
- Lunar tide in, near equator (Rastogi 1961)
- Effect of geomagnetic activity on, over central Africa (Rastogi 1962)
- Longitudinal effect in, equatorial (Rastogi 1963)
- Seasonal variations of lunar tidal effects in, over India (Rastogi 1963)
- Some regularities in (Ratcliffe 1951)
- Properties of (Roberts 1963)
- Geomagnetic distortion of, at equatorial latitudes (Sarma 1956)
- Disturbances in, associated with geomagnetic storm (Sato 1956)
- Dynamical structure of, as deduced from world-wide daily variations (Shimazaki 1959)
- Irregularities in, at Ibadan (Skinner 1954)
- Some geomagnetic effects in, equatorial (Skinner 1955)
- Effect of equatorial electrojet on (Skinner 1957)
- Magnetic field in, at Dakar (Suchy 1956)
- "Fade-out" [Sic., Suggest "blackout" (Id.)] of (Suryanarayana 1962)
- Photochemical rates in, equatorial, from 1958 eclipse (Van zandt 1960)
- Eclipse effects in (Wells 1946)
- New theory of formation of (Yonezawa 1956)
- Behavior of, during severe magnetic storms (Yonezawa 1963)
- Time and distance correlation study of ionosonde data (Zacharisen 1963)

**FOCUSING (see also HORIZON FOCUSING)**

Horizon (Thomas 1962)

Of radio waves, by  $E_s$  clouds (Umlauf 1960)

**$f_oF_2$  (see also VERTICAL INCIDENCE)**

Near-relationship to sunspot number (Allen 1946)

Regional anomalies in (Aono 1953)

Latitude dependence of, over the range  $20^\circ$  north to  $69^\circ$  south  
obtained by ship-borne ionospheric sounder (Ose 1959)

In quiet-day vertical cross sections of the ionosphere along  $75^\circ$  W  
geographic meridian (Wright, J. W., 1959)



## GENERAL IONOSPHERE

- Early determination of ionospheric height (Bansal 1936)
- Ionosphere research (Beagley 1952)
- True ionospheric height (Becker 1959)
- Tropical upper air studies (Belmont 1962)
- Characteristics of the upper region (Berkner 1936)
- Amplitude and phase spectrum (Bhattacharya 1963)
- Total reflection of electromagnetic waves (Bose 1938)
- Terrestrial Radio Waves (Bremmer 1949)
- Electron density over Atlantic Ocean (Bukin 1961)
- Electrical conductivity (Cowling 1963)
- Ionospheric data (CSIR 1962, 1963)
- Anomalous amplitude of seasonal effects in the equatorial ionosphere (Delobbeau 1954)
- Radar methods of study (Evans 1962)
- Discussion about special ionosphere characteristics: MUF (3000) of F<sub>2</sub> related to solar activity (Eyfrig 1937)
- Pressure and temperature equalization at 200 kilometers (Johnson 1960)
- Short-wave communication (Lied 1947)
- Distribution of electrons at night (Long 1962)
- Ionospheric data (NBS 1955)
- Ionosphere at Allahabad (Pant 1936)
- Soft corpuscular radiation at 320 kilometers near magnetic equator (Savenko 1962)
- Rate of electron production in ionosphere (Seaton 1947)
- Physics of fully ionized gases (Spitzer 1956)
- A method of solving integral equations for the vertical propagation of time-harmonic plane waves in anisotropic vertically inhomogeneous nonmagnetic media (Tomlinson 1958)
- Model (Woodward 1948)
- Ionospheric data: Woomera, Australia (WRE 1963)

## GEOMAGNETISM

- Solar and lunar diurnal variation of (Chapman 1919)
- Influence of earth conductivity on (Chapman 1922)

## **GEOMAGNETISM (Continued)**

Geomagnetism (Chernosky 1961)

Effect on F1 layer (Eyfrig 1955)

Daily variations of the electrical conductivity of the upper atmosphere as deduced from the daily variations of (Maeda, H., 1955)

Activity and spread F (Rao, C. V. S., 1962)

Control of ionosphere-geomagnetic influences on F1 and F2 regions (Rastogi 1956)

Effects of, activity on F2 region over Leopoldville (Rastogi 1961)

Effect of, on F2 region over Central Africa (Rastogi 1961)

Effects in equatorial F2 region (Skinner 1955)

## **GEOMAGNETIC ANOMALY (see ANOMALIES)**

## **GEOMAGNETIC CONTROL OF IONOSPHERE (see also FIELD-ALIGNED IRREGULARITIES: LUNAR TIDE)**

Control of F2-layer ionization (Appleton 1947, 1950)

Ionospheric storms and the F2-layer anomaly (Appleton 1953)

Anomalous equatorial belt in F2 layer (Appleton 1954)

Regularities and irregularities and (Appleton 1956)

Equatorial anomalies in the F2 (Appleton 1960)

Geomagnetic nature of F2 longitude effect (Bailey 1948)

Abnormalities in F region at Calcutta (Baral 1948)

Ionospheric critical frequencies and magnetic parameters of preceding day (Bergh 1961)

Distortion of E region (Beynon 1959)

Noon F2 ionization and geomagnetic coordinates (Bhar 1959)

Influence of disturbed conditions and increased solar activity (Bhargava 1962)

Control on F2 layer (Burkard 1954)

Control of equatorial F2 layer (Chakrabarty 1946)

Anomalies in behavior of F2 layer (Croom 1959)

Control of the F1 layer (Eyfrig 1955)

Effect on the F2 region (Eyfrig 1963)

Distortion of the F2 region near the magnetic equator (Hirono 1954)



## GEOMAGNETIC CONTROL OF IONOSPHERE (Continued)

Control of diffusion in the F2 region (Kendall 1962)  
The relationship between  $f_oF_2$  and magnetic phenomena (King 1962)  
Relationships between magnetic and ionospheric variations (King 1963)  
F2 ionization and geomagnetic latitudes (Liang 1947)  
Of high-altitude nuclear explosions (McNish 1959)  
Control of F2 region (Mitra, S. K., 1946)  
Control of F2 region at equatorial latitudes (Sarma 1956)  
Transequatorial backscatter observation of magnetic effects  
(Thomas 1961)

## GEOMAGNETIC DISTURBANCES (see also SUDDEN COMMENCEMENT)

Ionospheric variation associated with (Matsushita 1953)  
Ionospheric F2 variations associated with, at the equatorial  
zone (Matsushita 1955)  
And interrelations among upper-atmosphere disturbance phenomena  
over polar regions (Oguti 1960)  
Abnormal variation of earth's field (Rastogi 1961)

## GEOMAGNETIC EQUATOR

Variation of horizontal force near (Alexander 1957)  
Variation of noon F2 equivalent heights relative to (Appleton 1947)  
Some aspects of  $E_s$  ionization of (Bandyopadhyay 1963)  
Relation between noon F2-layer ionization and (Bhar 1957)  
Electron content at (Blumle 1962)  
VHF transmission across (Bowles 1960)  
Field-aligned ionization above (Bowles 1960)  
Profiles of electron density over (Bowles 1962)  
Radio wave scattering near (Bowles 1962)  
Vertical-incidence observations at (Bukin 1961)  
Rocket measurements of ionospheric currents near (Cahill 1958)  
Anisotropic field-aligned irregularities near (Egan 1960)  
Effects of diffusion of electrons near (Ferraro 1960)  
Diurnal variation of declination at (Fleming 1933, 1937, 1938)

## **GEOMAGNETIC EQUATOR (Continued)**

Magnetic daily variation near, at Koror (Gettemy 1962)  
Magnetic observations in the Philippines and (Glover 1963)  
Electron density distribution in the F region near (Goldberg 1962)  
Equilibrium electron density distribution in the F region near  
(Goldberg 1963)  
Short-path communication via the ionosphere near (Hagn 1963)  
Geomagnetic distortion of the F2 region near (Hirono 1954, 1955)  
Disturbance daily variation of Earth's field near (Hutton 1963)  
S variation of earth currents near (Hutton 1963)  
Radio echoes from field-aligned ionization at (Ireland 1962)  
Height of nighttime F-layer irregularities at (Kent 1961)  
Ionospheric cross moderation at (Klemperer 1963)  
An attempt to observe whistling atmospherics near (Koster 1955)  
Measurements of irregularities giving rise to radio-star scintilla-  
tions at (Koster 1963)  
Conductivity of the ionosphere and geomagnetic variations near  
(Lucas 1953)  
Observed facts of geomagnetic distortion near (Maeda, H., 1955)  
Geomagnetic distortion of the F2 region on (Maeda, H., 1959)  
Evidence for the ionospheric currents from rocket experiments near  
(Maple 1951)  
Discussed in symposium (McNish 1950)  
Studies of equatorial F region and location of (Rao, B. C. N., 1962)  
And characteristic features of equatorial ionosphere and location  
of F-region equator (Rao, B. C. N., 1962)  
Modulation tests for 1160-kilometer path, along (Stiltner 1963)  
Polarization of radio waves from ionosphere near (Wells 1936)  
Vertical cross sections of ionosphere across (Wright, J. W., 1962)

## **GEOMAGNETIC FIELD**

Of the quiet-time proton belt (Akasofu 1962)  
And control of F2 layer (Appleton 1947)  
Particle motion in equatorial plane of (Avrett 1962)  
And of the F2 layer longitude effect (Sailey 1948)

## GEOMAGNETIC FIELD (Continued)

- And conductivity of ionosphere (Baker 1952)
- Three-hour range indices o. (Bartels 1940)
- Geomagnetic data on variations of solar radiation (Bartels 1946)
- And of the equatorial current (Ben 'Kova 1962)
- And ionospheric critical frequencies (Bergh 1961)
- The time lag between ionospheric changes and (Bergh 1961, 1962)
- And ionosphere investigations (Berkner 1934)
- Systematic ionospheric changes associated with (Berkner 1940)
- And distortion of E region (Beynon 1959)
- Ionization in relation to coordinates of (Shar 1959)
- Earth magnetism (Chapman 1939)
- Geomagnetism main field (Chernosky 1961)
- And the ionosphere (Hines 1963)
- And distortion of the F2 region near the magnetic equator (Hirono 1954)
- Equatorial micropulsations of, and ionospheric disturbance currents (Hutton 1962)
- Disturbance daily variation of, near magnetic equator (Hutton 1963)
- Abnormal variation of, horizontal intensity at Huancayo (Ibrahim 1953)
- Note on tidal theory of Sq and (Ingraham 1959)
- Related to solar phenomena and ionospheric irregularities (Lejay 1959)
- And ionospheric relationships (Lewis 1953)
- Periodicities of, at Huancayo (London 1963)
- Bi-pole diffusion of ionization in (Lyon 1963)
- Variations in, at Ibadan--solar variations (Onwumechilli 1959)
- Lunar and luni-solar variations in, H and Z (Onwumechilli 1959)
- Fluctuations in horizontal component of, near magnetic equator (Onwumechilli 1960)
- Fluctuations in horizontal component of (Onwumechilli 1962)
- Effect of ring current on terminal shape on (Spreiter 1962)
- Possibility of a 26- to 27-month periodicity in, equatorial, and correlation with stratospheric winds (Stacey 1962)
- In F2 layer at Dakar (Suchy 1956)
- And actual heights in ionosphere at Huancayo (Talis 1962)
- Mutual dependence of harmonic coefficients used to define (Tsun 1960)

#### GEOMAGNETIC SUDDEN IMPULSES

- Correlated with large-scale traveling disturbances (Chan 1962)
- Daytime enhancement of amplitude of, in equatorial region (Maeda, H., 1960)
- Simultaneity of (Yamamoto 1961)
- Crochet of 15 November 1960 (Yasuhara 1961)

#### GEOMAGNETIC TIDES (see also LUNAR TIDES; SOLAR TIDES)

- Horizontal intensity at Huancayo (Bartels 1940)

#### GEOMAGNETIC STORMS (see also IONOSPHERIC STORMS)

- Electric current systems of (Chapman 1935)
- Disturbance field variations during (Cynk 1939)
- Ionospheric variations during (Matsushita 1963)
- Disturbances in F2 region associated with (Sato 1956)
- Disturbances in F1 and E regions associated with (Sato 1957)

#### GHANA

- Diurnal variation of earth currents in (Hutton 1961)
- Equatorial micropulsations and ionospheric disturbance currents at, Legon (Hutton 1962)
- Scintillations of radio stars and magnetic activity in (Koster 1961)
- Position and movement of equatorial electrojet over (Osborne, D. G., 1962)
- Equatorial drift and the electrojet in (Osborne, D. G., 1963)

#### GROUND CONSTANTS

- Physical factors involved, methods of measurement, etc. (CCIR 1963)
- Determination of conductivity by measurements at earth's surface (Higgins 1961)
- Ground-wave field intensities, etc. (Signal Corps R.P.A. 1956)
- Curves of ground proximity loss for dipole antennas (Vogler 1963)

#### GROUND WAVE

- Propagation curves (Bremmer 1949)
- Propagation curves for frequencies below 10 Mc (CCIR 1963)
- Propagation curves for VHF/UHF broadcasting in the African continent (CCIR 1963)
- Field intensity (Dickinson 1956)

#### GROUP VELOCITY

- Curves for propagation in ionosphere (Bajpai 1937)
- And group height from magneto-ionic theory (Shinn 1952)

#### GYRO-FREQUENCY (see also SPLITTING)

- In ionospheric regions (Datta, S., 1959)
- Measured in F region over Hobart, Tasmania (Ellis 1957)
- And self-gyrointeraction (Mitra, S. N., 1955)
- And magnetic field of F region from  $h'f$  records (Singh, R. N., 1962)
- And magnetic field in the F2 layer at Dakar (Suchy)

#### HAIFA, ISRAEL

Seasonal anomaly in total electron content--summer decrease  
(Altman 1963)

#### HAWAII

Solar flare effects on atmospheric noise in (Herman 1961)  
Spatial dependence of time-variations of geomagnetic field on  
Oahu (Mason 1963)  
Spread F over (Reber 1954)

#### HORIZON FOCUSING (see also FOCUSING)

Final report on (Thomas 1962)

#### HORIZONTAL GRADIENT (see also TILT)

Of ionization in the ionosphere (Bannerjee, S. S., 1953, 1954)  
In quiet-day vertical cross sections along 75°W meridian  
(Wright, J. W., 1959)

#### HUANCAYO, PERU

Anomaly in total electron content over (Altman 1963)  
Some aspects of  $E_s$  at (Bandyopadhyay 1963)  
Studies on sporadic E and electrojet from (Baral 1952)  
Daily magnetic variation at (Bartels 1939)  
Horizontal intensity at (Bartels 1940, 1946)  
 $L(fF_2)$  at (Bartels 1949)  
Twenty-seven-day variations in F2-layer critical frequencies at  
(Bartels 1950)  
Ionosphere investigations at (Berkner 1934)  
Characteristics of upper ionospheric regions near (Berkner 1936)  
Abnormal ionization of E region at (Berkner 1937)  
Ionospheric effects associated with magnetic disturbances at  
(Berkner 1939)  
Satellite observations of electron content at (Blumle 1962)  
Studies of scattering phenomena from (Bowles 1960)

HUANCAYO, PERU (Continued)

- Studies of height oscillations of F2 from (Burkard 1950)
- Electron annihilation in F2 over (Burkard 1950)
- Studies on ionospheric tidal effect at (Burkard 1951)
- Spread F over (Calvert 1961)
- Magnetic variation at (Casaverde 1961)
- Effects of nuclear explosion over Johnston Island observed at (Casaverde 1963)
- Occurrence of  $E_s$  at (Chadwick 1962)
- Normality at (Chapman 1951)
- Diurnal variation of the electron density of F2 at equatorial stations (Eyfrig 1950)
- Study of Earth's magnetic elements and reflection from ionospheric layer at (Fleming 1933)
- Lunar stratification of F2 layer at (Gautier 1951)
- Abnormal variation of horizontal magnetic intensity at (Ibrahim 1953)
- Lunar influence on  $E_s$  at (Knecht 1959)
- The ionosphere at (Ledig 1941, 1946)
- Theory of lunar effects and mid-day decrease of F2 density at (McNish 1949)
- Measurements at, discussed in symposium (McNish 1950)
- Lunar diurnal variation in earth currents at, compared to Tuscon (Rooney 1938)
- Sudden decrease in cosmic ray intensity at (Sandstrom 1958)
- Disturbances in F2 region associated with geomagnetic storms observed at (Sato 1956)
- Ionospheric electron densities at (Schmerling 1958)
- Behavior of 6300 OI line at (Silverman 1961)
- A comparative study of geomagnetic ionospheric changes at Kodaikanal and (Sivaramakrishnan 1956)
- Electron density and true height during IGY at (Somayaajulu 1963)
- Critical frequency observations of E layer at (Wells 1934)
- Polarization of radio waves from ionosphere at (Wells 1936)
- Multiple-frequency recording of radio wave polarization near geomagnetic equator from (Wells 1940)

HUANCAYO, PERU (Concluded)

The ionosphere at, July to September 1940 (Wells 1941)

Ionospheric investigations at (Wells 1942)

Eclipse effects in F2 layer observed at (Wells 1946)

F scatter at (Wells 1954)



## IBADAN, NIGERIA

Sunset fading observed at (Bennington 1960)  
Lunar variations at F2 layer at (Brown 1956)  
Height of night-time F-layer irregularities at (Kent 1961)  
Ionospheric soundings at, during eclipse of 25 February 1952  
(Lejay 1956)  
Equatorial spread F at (Lyon 1961)  
Lunar and luni-solar variations of geomagnetic field at  
(Onwumechilli 1959)  
Lunar daily variation of magnetic declination at (Onwumechilli 1960)  
F2 irregularities at (Skinner 1954)  
Multiple stratification of F layer at (Skinner 1954)  
Ionospheric absorption at (Skinner 1956)  
Horizontal drift measurements in ionosphere at (Skinner 1958, 1963)  
Spread F at (Wright, R. W., 1956)  
Lunar tides in sporadic E at (Wright, R. W., 1959)

## IGY

F-layer scatter in Far East observed during (Bateman 1959)  
NBS equatorial VHF scatter research during (Bowles 1957, 1959)  
Measurements at magnetic equator for (Bowles 1962)  
Ionospheric VHF scattering near magnetic equator during (Cohen 1963)  
Reflecting properties of ionosphere between 350 and 1500 kc/s at  
Tsumeb during (Elling 1960)  
Report on oblique-incidence sporadic-E and F-scatter program for  
(Finney 1960)  
NBS radio, ionosphere, and airglow observations during (Gates 1959)  
Daily index of F2-layer disturbance during (Piggott 1960)  
Ionospheric observations at Madras during (Rangaswamy 1962)  
Diurnal variation of absorption at Waltair during (Rao, B. R., 1958)  
Some results of true-height survey during (Schmerling 1961)  
Proton magnetometer satellite ground stations for (Shapiro 1961)  
Study of spread-F occurrence during (Shimazaki 1959, 1960)  
Study of occurrence of spread F in severe magnetic storms during  
(Shimazaki 1960)

#### IGY (Continued)

- Study of geomorphology of spread F during (Singleton 1960)
- Electron density and true-height variations at Talara and Huancayo during (Somayaजू 1963)
- Seasonal, latitudinal, and diurnal variations in the upper atmosphere during (Stroud 1961)
- Characteristics of F2 layer during severe magnetic storms of (Yonezawa 1963)

#### INCOHERENT SCATTER

- Equatorial electron density profiles using (Bowles 1962)
- Profiles of electron density obtained by (Bowles 1962)
- Effect of Faraday rotation on (Millman 1961)

#### INDIA (see also individual stations)

- Ionospheric data, predictions from (CSIR 1962, 1963)
- Abnormal ionospheric behavior at 30 Mc/s in (Krishnamurthi 1958)
- Ionospheric studies in (Mitra, S. K., 1936)
- Seasonal variations of the lunar tide effect in the F2 region over Indian stations (Rastogi 1963)

#### INTERTROPICAL ZONE (see also TRANSEQUATORIAL)

- Red line from night sky in (Barbier 1961)

#### IONOGRAM, EQUATORIAL

- From an experiment with low-power ionosonde equipment in equatorial latitudes (Busch 1963)
- Spread F appearing on (Calvert 1961)
- From path Tripoli to Accra (Davies 1962)
- Study of sporadic E using (Singh, R. N., 1963)

#### IONOSPHERE (see GENERAL IONOSPHERE)

**IONOSPHERE CURRENTS (see also Sq CURRENT; ELECTROJET)**

- Ionospheric conductivity and (Baker 1952, 1953)
- Rocket measurements of (Cahill 1958)
- Induction of electric currents in ionosphere (Hanna 1959)
- Equatorial micropulsations and (Hutton 1962)
- Responsible for sudden commencements observed at geomagnetic equator (Ondoh 1961)
- And disturbances in F2 region associated with magnetic storms (Sato 1956)
- Evidence for, from rocket measurements near magnetic equator (Singer 1951)
- Caused by non-periodic winds (Var. Sabben 1962)

**IONOSPHERIC STORM (see also MAGNETIC STORM)**

- World morphology of (Appleton 1950)
- Morphology on, in the F2 layer (Appleton 1952)
- Geomagnetic anomaly in the F2 layer and (Appleton 1953)
- In the ionosphere (Appleton 1955)
- Study of the morphology of (Matsushita 1959)
- And HF circuit reliability, frequency utilization, and forecasting (Nelson 1953)
- And daily index of F2-layer disturbance (Piggott 1960)
- Note on measurements related to, at Waltair (Rao, B. R., 1954)
- Investigation of, by spaced receiver method (Rao, B. R., 1956)
- Ionosphere storms (Ratcliffe 1963)
- Associated with Echo I satellite (Tiuri 1963)

**IRREGULARITIES, IONOSPHERIC (see also ANOMALIES; SPREAD-F; SCINTILLATION; FIELD-ALIGNED IRREGULARITIES; REGULARITIES)**

- Fading of waves reflected from (Awe 1961)
- In F2 by drift measurements (Becken 1960)
- Ionization of the E region, including (Berkner 1937)
- Near magnetic equator (Bowles 1960)
- Study of horizontal (Briggs 1950)

## IRREGULARITIES, IONOSPHERIC (Continued)

- Study of, causing spread F and scintillation of radio stars (Briggs 1958)
- Elongation of, in the equatorial ionosphere (Clemesha 1963)
- Study of, in equatorial ionosphere (Clemesha 1963)
- Associated with electrojet (Cohen 1962)
- Height of, in nighttime F-layer at equator (Kent 1961)
- Equatorial study of (Kent 1963)
- The size of moving, in F region (Khastgir 1960)
- Measurements of, associated with scintillations (Koster 1963)
- Abnormal ionospheric behavior at 10 metres (Krishnamurthi 1958)
- Motions of, a survey (Kushnerevsky 1961)
- Ionospheric, in general (Lejay 1959)
- Fading and Random motion of (Mittra, S. N., 1957)
- Variations in height of anisotropy and random drift philosophy of (Rao, B. R., 1961)
- From study of horizontal drift and anisotropy in E region (Rao, G. L. N. 1963)
- Of F2 region, at some southern high-latitude stations (Rastogi 1960)
- In equatorial ionosphere (Wright, R. W. H., 1962)

## **JOHANNESBURG, SOUTH AFRICA**

Sunset fading effects at (Bennington 1960)

## **JUNGLE RADIO COMMUNICATION**

Radio communication and Loran navigation in SW Pacific (Bateman 1944)

Panama VHF and HF jungle propagation (Craig 1963)

Propagation through New Guinea rain forest (DSIR 1944)

Measurement of factors affecting propagation (Herbstreit 1943)

Measurement of attenuation by jungle (Herbstreit 1964)

Tactical jungle communications study (Krevsky 1963)

HF and VHF attenuation in jungles (Krevsky 1963)

Research-engineering for tropical communication (Vincent 1963)

**KHARTOUM, SUDAN**

Ionospheric soundings during eclipse of 25 February 1952 (Lejay 1956)

**K INDICES (see also MAGNETIC PARAMETERS)**

Standardization of (Bartels 1940)

Of day before, and ionospheric critical frequencies (Bergh 1961, 1962)

**KJELLER, NORWAY**

Drift measurements at (Becken 1960)

**KODAIKANAL, INDIA**

Sunrise anomaly (no echo) over (Bhargava 1952)

Spread F layer over (Bhargava 1958)

Magnetic storms at (Bhargava 1959)

Geomagnetic disturbance effects on  $E_s$  at (Bhargava 1961)

Influences of disturbed conditions and increased solar activity on geomagnetic distortion of equatorial F2 region near (Bhargava 1962)

Lunar-tidal effects in  $E_s$  over (Bhargava 1963)

Sporadic E layer at (Rangarajan 1954)

Comparative study of geomagnetic and ionospheric changes at Huancayo and (Sivaramakrishnan 1956)

**KOKUBUNJI, TOKYO, JAPAN**

Characteristic behavior of F2 layer during severe magnetic storms during IGY at (Yonezawa 1963)

**KOROR, PALAU ISLANDS**

Magnetic daily variations at (Gettemy 1962)

**KWAJALEIN, MARSHALL ISLANDS**

Stratospheric air studies at (Belmont 1962)

#### LEOPOLDVILLE-BINZA, CONGO

- Lunar semidiurnal variation of D and F2 layers at (Bossolasco 1960)
- Analysis of maximum electron density of F2 layer at (Herrinck 1960)
- Ionospheric soundings during eclipse of 25 February 1952 (Lejay 1956)
- Some effects of geomagnetic activity on F2 region over (Rastogi 1961)
- Lunar tide in F2 layer at, out of phase with other stations (Rastogi 1961)
- Abnormal variations in earth's magnetic field at (Rastogi 1961)

#### LIGHTNING (see also THUNDERSTORM; ATMOSPHERIC NOISE)

- Amplitude and phase spectrum of radio atmospherics (Bhattacharya 1963, 1964)
- From tropical thunderstorms (Chandrashekhar Aiyar 1955, 1956, 1963)
- Ground flashes of tropical HF noise (Chandrashekhar Aiyar 1960)
- From cloud to ionosphere (Isted 1955)
- Energy spectrum of atmospherics and attenuation of LF with distance (Khastgir 1960)
- Waveforms of atmospherics (Tantry 1958)

#### LIMA, PERU

- Electron density profiles over (Bowles 1962)

#### LINEARLY POLARIZED ANTENNA

- For North-South orientation on 4 Mc/s at Allahabad (Bajpai 1936)
- Orientation of, for short-path communication via the ionosphere near the geomagnetic equator (Hahn 1963)

#### LONGITUDE EFFECT (see also ANOMALIES)

- Geomagnetic nature of, in F-2 layer (Baily 1948)
- In temperate zone Sporadic E (Finney 1960)
- In temperate zone Sporadic E (Heisler 1960)
- In geomagnetic solar daily variation, a new effect (Knapp 1963)
- Graphical representation of (Minnis 1952)
- In the equatorial F-2 region (Rastogi 1963)

#### **LONGITUDE EFFECT (Continued)**

And latitude effect estimated for ionosphere from Japan to Antarctica (Shibata 1960)

#### **LORAN**

Measurement of factors affecting (Bateman 1944)

#### **LOWEST USEFUL HIGH FREQUENCY (LUF)**

IBM 704 program to determine (Probst 1959)

An analytical method of obtaining (Sukhia 1953)

#### **LUF LUNAR EFFECTS (see also LOWEST USEFUL FREQUENCY)**

Theory of, and midday degrees in F2 density at Huancayo (McNish 1949)  
Equatorial sporadic E and (Matsushita 1957)

Diurnal variation of horizontal component near magnetic equator and (Onwumechilli 1963)

On  $f_oF_2$  at Leopoldville, Lwiro, and Nairobi (Rastogi 1961)

#### **LUNAR TIDE (see also SOLAR TIDE)**

In upper atmosphere (Appleton 1939)

In variations in the F2 region over Calcutta (Baral 1956)

Conclusions about ionosphere from (Bartels 1936)

Effects of, in equatorial  $E_s$  (Bhargava 1963)

Fluctuation of F2 ionization and (Bibl 1963)

In F2 layer at Dakar, Senegal (Delobbeau 1955)

In variations of height and electron density of F2 layer (Duncan 1956)

In effect on median height of F2 layer (Eyfrig 1952)

In stratification of F2 layer at Huancayo (Gautier 1951)

In theory of Sq magnetic field (Ingraham 1959)

Influence on sporadic E at Huancayo (Knecht 1959)

In variation of midday critical frequencies of the F2 layer at low latitude (Kotadia 1962)

In magnetic variation observed near magnetic equator and (Lucas 1953)

In variations in F region near magnetic equator (Martyn 1947)



#### LUNAR TIDE (Continued)

- In variations in the sporadic E region (Matsushita 1953)
- Discussed in symposium (McNish 1950)
- Separation of semi-diurnal effect on individual days and some equatorial features of (Onwumechilli 1963)
- In F2 critical frequency at Singapore (Osborne, B. W., 1952)
- In daily variation of horizontal drifts at Waltair (Ramana 1962)
- On the seasonal variation in, and solar geomagnetic tides near the equator (Rao, K. S. R., 1961)
- In F2 layer near geomagnetic equator (Rastogi 1961)
- Enhancement of, in noon critical frequency of F2 over magnetic equator (Rastogi 1962)
- Longitudinal inequalities in, and in sudden commencement in H near magnetic equator (Rastogi 1963)
- And variations in equatorial electrojet current (Rastogi 1963)
- In F2 region--a synoptic view (Rastogi 1963)
- Effects of seasonal variations of, in F2 layer over India (Rastogi 1963)
- Control of abnormal transequatorial propagation and (Thomas 1962)
- In sporadic E layer at Ibadan (Wright, R. W., 1959)

#### LUNAR VARIATIONS

- Early observation of, at Allahabad (Bajpai 1936)
- And disappearance of  $E_s$  over Kodaikanal (Bhargava 1961)
- Semidiurnal, of D and F2 layers (Bossolasco 1960)
- Of F2 layer at Ibadan (Brown 1956)
- Ionospheric, at low-latitude stations (McNish 1949)
- Of magnetic declination at Ibadan (Onwumechilli 1960)

#### LWIRO, CONGO

- Peculiarity of the F2 layer at (Bonnet 1954)
- Solar and lunar variation of F2 at (Rastogi 1961)

#### **MACAO (PORTUGUESE)**

Weather at, during southwestern monsoon, correlated with height of ionosphere (Gherzi 1952)

#### **MADRAS, INDIA**

Wave forms of atmospherics at (Rajam 1936)

Ionospheric observations at, during IGY and IGC (Rangaswamy 1962)

Total electron content in F2 layer over, 1959 (Rao, C.S.R., 1962)

Flutter fading in transmissions from (Rao, N.S.S., 1949)

#### **MAGNETIC ACTIVITY (see also MAGNETIC STORMS; MICROPULSATION)**

Main features of daily variations of (Bartels 1936, 1939)

Three-hour indices of (Bartels 1940)

Effect of, on equatorial spread F (Krishnamurthy 1963)

Equatorial spread F and (Lyon 1958)

Effect of, on drifts in F2 region at Waltair (Rao, B. R., 1959)

Related to equatorial spread F and post-sunset height changes (Rao, M.S.V.G., 1961)

Effect of, on sporadic E (Rawer 1953)

And distribution of ionization about equator (Ross 1963)

Auroral phenomena and world-wide disturbances in (Rostad 1935)

Effects of, on vertical diffusion of electrons near equator (Schmerling 1960)

Effects of, from Argus experiment observed at magnetic equator (Selzer 1959)

Vector field proton magnetometer for IGY satellite ground stations (Shapiro 1960)

#### **MAGNETIC COORDINATES**

Graphic displays of geomagnetic geometry (Dudziak 1963)

New system of coordinates for the equatorial ring (Mayaud 1960)

Geomagnetic coordinates for the entry earth (McNish 1936)

#### **MAGNETIC EQUATOR (see GEOMAGNETIC EQUATOR)**

**MAGNETIC FIELD (see also GEOMAGNETISM)**

- Field of the quiet-time proton belt (Akasofu 1962)
- Measurement of intensity in ionosphere (Appleton 1934)
- Particle motion in equatorial plane of dipole magnetic field (Avrett 1962)
- Field of the equatorial ring current (Ben'Kova 1962)
- Magnetograms and hourly values at Guam (IGY 1960)
- Magnetograms and hourly values at Koror (IGY 1960)
- Possible asymmetry in daily range of vertical intensity near magnetic equator (Onwumechilli 1959)
- Effect on ionospheric backscatter (Salpeter 1961)
- The mutual dependence of harmonic coefficients (Zmuda 1960)

**MAGNETIC PARAMETERS (see also K-INDICES)**

- Correlation with ionospheric critical frequencies (Bergh 1961)
- Variation of declination at magnetic equator (Fleming 1933, 1937, 1938)

**MAGNETIC STORMS (see also GEOMAGNETIC CONTROL OF IONOSPHERE; MAGNETIC ACTIVITY; IONOSPHERIC STORMS)**

- Enhancement of equatorial electrojet during polar substorms (Akasofu 1963)
- Ionospheric effects associated with (Berkner 1939)
- Ionospheric changes associated with (Berkner 1940)
- Ionospheric disturbances associated with (Bhargava 1959)
- Effects of, in equatorial  $E_s$  (Bhargava 1961)
- And cosmic noise absorption on 25 Mc/s at Ahmedabad (Bhonsle 1960)
- And normality at Huancayo (Chapman 1951)
- Variations in the disturbance field on (Cynk 1939)
- Some patterns of the diurnal, seasonal, and latitude distribution of (Dubrovski 1962)
- Enhanced transequatorial propagation following (Ferrell 1951)
- Propagation of world-wide sudden commencement of (Gerard 1959)
- Statement of agreement regarding the ring-current effect (Hines 1960)
- Equatorial enhancement of sudden commencements of (Jacobs 1963)

#### **MAGNETIC STORMS (Continued)**

- And distribution of ionospheric disturbances during the geomagnetic bay (Kamiyama 1953)
- Relationship between radio transmission path and effects of (Kenrick 1938)
- Magnetic and ionospheric disturbance in low latitudes (Kotadia 1961)
- Of 11 February 1958, and associated changes in the F2 layer of the ionosphere in low and middle latitudes (Kotadia 1962)
- In connection with flutter fading, spread echoes, radiation belt (Lal 1960)
- Solar corpuscular activity and ionization density in (Lal 1963)
- Equatorial ionospheric variations during (Matsushita 1963)
- Forecasting of, associated with solar flares (Nelson 1963)
- Polar ionospheric disturbances associated with (Obayashi 1958)
- World-wide occurrence probability of spread F during (Shimazaki 1960)
- Behavior of F2 layer during (Yonezawa 1963)

#### **MAGNETO-HYDRODYNAMICS**

- Plasma physics and (Auckland 1962)
- Magneto-hydrodynamics (Ferraro 1955)

#### **MAGNETO-IONIC THEORY**

- Particle motion in the equatorial plane of a dipole magnetic field (Avrett 1962)
- Absorption of radio waves in resonance regions of a non-homogeneous plasma (Denisov 1959)
- Theory of electrostatic fields in a horizontally stratified ionosphere subject to magnetic field (Farley 1959, 1960)
- Absorption of HF radio waves under conditions where the QT approximation is valid (Hagn 1963)
- Induction of electric currents in a nonisotropic, non-uniform ionosphere, by magnetic potential (Hanna 1959)
- Dispersion and absorption curves for ionospheric propagation according to the (Martyn 1935)
- Refractive and absorptive indices derived from (Murty, Y.S.N., 1963)
- And its applications to the ionosphere (Ratcliffe 1959)
- Group velocities and group heights from (Shinn 1952)

#### MAXIMUM USABLE FREQUENCIES (MUF)

- Prediction of, for transequatorial path (Allcock 1956)
- Warning of fading (Ames 1963)
- Calculation of (Kelley 1955)
- IBM 704 program to determine (Probst 1959)
- Influence of weather conditions on, for long-distance short-wave transmissions (Rao, N.S.S., 1950)
- Analytical method of obtaining (Sukhai 1953)

#### MAYAGÜEZ, PUERTO RICO

- Frequency-selective fading and multipath between Smyrna, Ga. and (Ames 1963)
- Transequatorial backscatter echoes as observed at (Dueño 1960)

#### MEDIUM WAVE (see also BROADCASTING)

- Propagation of, in equatorial latitudes (Barghausen 1964)
- Importance of wave polarization at, near magnetic equator (Davies 1964)
- Limiting polarization of, from ionosphere (Eckersley 1939)
- Long-period fading in, signals (Rao, M.S.R., 1955)
- Fading of, in oblique-incidence transmissions (Rao, M. S., 1958)
- Polarization of downcoming (Satyanarayana 1952)

#### METEORS

- Meteoric E-layer (Baird 1954)
- Main source of  $E_s$  (Baral 1952)
- Increase in E ionization (Bhar 1937)
- Observations of waves reflected from meteor trails (Briggs 1954)
- Meteoric E-layer (Naismith 1954)
- Bibliography of propagation (Vincent 1960)

#### MICROPULSATION

- Short-range spatial coherence of (Duffus 1962)
- Observations in Philippines (Glover 1963)

#### **MICROPULSATION (Continued)**

At equator (Hutton 1960)

Occurrence frequency of (Jacobs 1960)

Studies of, at Brisbane (Mainstone 1963)

Studies of, at Brisbane (McNicol 1963)

#### **MICROWAVE**

Propagation (Hulburt 1935)

Experimental study of propagation of 10-centimeter wave over short non-optical sea path (Stack-Forsyth 1955)

#### **MIDDAY DECREASE, $f_oF_2$ (see also ANOMALY; CRITICAL FREQUENCY; ELECTRON DENSITY)**

Original observation of, at Huancayo (Berkner 1934)

Non-seasonal change of, at Washington and Watheroo (Berkner 1938)

Relation to magnetic dip (Bhar 1957)

In noon  $F_2$  ionization in relation to geomagnetic coordinates (Bhar 1959)

In noon median  $F_2$  critical frequencies at low latitude (Bhargava 1959)

Theory of lunar effects of, and measurements at Huancayo (McNish 1949)

Practical determination of electron density, showing (Osborne, B. W., 1952)

#### **MODULATION**

Under test, for 1160-kilometer path along magnetic equator (Stiltner 1963)

In voice tests in a tropical environment (Vincent 1963)

#### **MONROVIA, LIBERIA**

Flutter fading on path between Accra and (Barghausen 1962)

Measurements on paths between Monrovia and Accra and Natal (Barghausen 1963)

#### **MUF (see MAXIMUM USABLE FREQUENCY)**

## MULTIPATH

Correlation between frequency selective fading and (Ames 1963)

## MULTIPLE REFLECTIONS

High, from F2 at Brisbane (Baird 1954)

Discrepancies in ionospheric absorptions deduced from (Piggott 1960)

## NAIROBI, KENYA

Abnormal variations of earth's magnetic field at (Rastogi 1961)

## NATAL, BRAZIL

HF path between Monrovia and (Barghausen 1963)

## NATAL, S. AFRICA

Atmospheric super-refraction and anomalous propagation at  
(Phillips, W. E., 1951)

## NEW ZEALAND

Two anomalies in the ionosphere at (Appleton 1946)

Ionospheric research in (Beagley 1952)

NOON MINIMUM (see MIDDAY DECREASE,  $f_oF_2$ )

## NUCLEAR EXPLOSION

Particle motion in the equatorial plane of the dipole magnetic  
field (Avrett 1962)

Over Johnston Island observed in Peru (Casaverde 1963)

Of 9 July 1962, magnetic effects in Philippines (Glover 1963)

Of 9 July 1962, and synchrotron radiation decay at equatorial sites  
(Goldman 1963)

Artificial geomagnetic and ionospheric storms associated with  
(Matsushita 1959)

Geomagnetic effects of, at high altitude (McNish 1959)

Propagation disturbances caused by (Obayashi 1960)

Observations of synchrotron radio noise at the magnetic equator  
following (Ochs 1963,

Ionospheric effects of, following distant detonations (Saha, A. K.,  
1963, 1964)

Magnetic effects of, in France, at the equator, and in the Antarctic,  
from ARGUS (Selzer 1959)

World-Wide geomagnetic effects of, on 9 July 1962 (Shirgaokar 1962)

Ionospheric effects due to (Utlaut 1959)



## **OBLIQUE INCIDENCE**

- Effect of magnetic field over equatorial region (Chatterjee 1952)**
- Experimental results (Delobbeau 1955)**
- Skip distance of radio waves and propagation of microwave (Hulburt 1935)**
- MUF factor and solar activity (Rao, C.S.R., 1962)**
- Fading of medium wave transmissions at (Rao, M. S., 1958)**
- Long-distance pulse propagation experiment on 20.1 Mc/s (Silberstein 1958)**
- Pulse observation near MUF (Somayajulu 1952)**

#### PARABOLIC LAYER METHOD

Application to radio communication (Appleton 1940)

#### PHASE STABILITY (see also DOPPLER TECHNIQUE)

In VLF propagation measurements for Radux-Omega navigation system  
(Casselman 1959)

Of 1600-km path (Smith, W. B., 1961)

#### PHILIPPINE ISLANDS

IGY observation of F-layer scatter (Bateman 1959)

#### PLASMA (see also ACOUSTIC)

Plasma physics and magnetohydrodynamics--bibliography (Auckland 1962)

Plasma diffusion in the ionosphere (Chandra 1964)

Absorption of radio waves in resonance regions of a nonhomogeneous  
plasma (Denisov 1959)

Instability and ionospheric irregularities (Farley 1963)

#### POLARIZATION, WAVE (see also FARADAY EFFECT)

Of Es echoes at Waltair (Abhirama Reddy 1962)

Of HF radio waves observed at low latitude (Abhirama Reddy 1963)

Of Es at low latitude as indicating Es structure (Abhirama Reddy 1963)

Of Z echo at Waltair (Abhirama Reddy 1963)

Theoretical, at Waltair, India (Abhirama Reddy 1963)

Polarimeter for study of low-frequency radio echoes (Benner 1950)

Sensitivity to polarization at HF near magnetic equator (Bowles 1960)

Of VHF echoes at magnetic equator (Bowles 1960)

Importance of, at medium wave near geomagnetic equator (Davies 1964)

Limiting polarization of medium wave from ionosphere (Eckersley 1939)

Of downcoming radio waves near geomagnetic equator (Hagn 1963)

Non-reciprocity fading and (Jull 1962)

Observed at vertical incidence (Morgan 1955)

Parameters, of the downcoming radio wave (Murty 1960)

## **POLARIZATION, WAVE (Continued)**

- For vertical propagation (Roy 1955)
- Of downcoming wireless waves of medium wavelengths (Satyanarayana 1952)
- Of echoes from sporadic E and F regions (Satyanarayana 1956)
- From ionosphere on geomagnetic equator (Wells 1936)
- Multiple-frequency recordings of, at Huancaayo (Wells 1940)

## **POONA, INDIA**

- Atmospheric noise in 3-Mc/s band at (Chandrashekhar Aiya 1955)
- Atmospheric noise, 2.5-to-20.0-Mc/s band at (Chandrashekhar Aiya 1959)
- Atmospheric noise in standard BC band at (Chandrashekhar Aiya 1959)
- Atmospheric noise in 5-Mc/s band at (Phadke 1955)

## **PREDICTION, IONOSPHERIC (see also MUF, LUF)**

- Using observations at ionosphere stations to estimate current values of ionospheric characteristics at other locations (Zacharisen 1963)

## **PULSES (see also ECHOES)**

- Observations at Calcutta of (Baral 1952)
- Measurements of ionosphere, a modified Hammarlund Super-Pro communication receiver for (Mitra, S. N., 1951)
- Study of, Long-range pulse-propagation experiment on 20.1 Mc/s (Silberstein 1958)

#### **RADIO NOISE (see also ATMOSPHERIC NOISE)**

Characteristics of terrestrial (Chrichlow 1960)

Revised data (Kelley 1960)

Indices of solar activity based on (Minnis 1959)

Ionospheric wave propagation and (Saha, M. N., 1938)

F scatter and, cosmic, on 25 Mc/s at Ahmedabad (Shirke 1959)

#### **RADIO-STAR OBSERVATIONS**

Measurement of ionospheric drift by (Dueño 1961)

Diffraction of radio waves from, passing through a phase-changing ionosphere (Hewish 1951)

In radio-astronomy in the tropics (Huntley 1953)

Scintillation of, at an equatorial station (Koster 1958)

Scintillations of, and magnetic activity in Ghana (Koster 1961)

Scintillation of, and movements in ionosphere (Lepechinsky 1955)

#### **RAY TRACING**

Transequatorial (Thomas 1962)

#### **RECOMBINATION COEFFICIENTS**

Of ionosphere over Calcutta (Baral 1950)

Estimated from growth of F2 layer (Berkner 1940)

Of F2 deduced from luni-solar variations (Brown 1956)

And electron annihilation in F2 layer (Burkard 1950)

In the lower ionosphere, theoretical and experimental study of (Mitra, A. P., 1954)

Associated with nighttime E-layer critical frequency (Piggott 1955)

In F2 region, from study of solar eclipse (Van Zandt 1960)

#### **REFLECTION**

Microscopic equations of ionospheric (Bose 1938)

## REFRACTION

- Effect of transverse magnetic field on (Bannerjee, S. S., 1939)
- Index of, and absorption index of ionosphere (Murty, Y.S.N., 1963)
- Experimental study of, in propagation of 10-centimeter waves over short non-optical sea path (Stack-Forsyth 1955)

## REGULARITIES (see also ANOMALIES; IRREGULARITIES; FIELD-ALIGNED IRREGULARITIES)

- In ionosphere (Appleton 1956)
- Of the ionospheric F region (Chatterjee 1953, 1954)
- In F2 region (Ratcliffe 1951)
- In F2 layer at Ibadan (Skinner 1954)

## RING-CURRENT

- Geomagnetic disturbance, Van Allen belt, and (Akasofu 1961)
- Magnetic field of, equatorial (Ben'Kova 1962)
- Statement of agreement regarding (Hines 1960)
- Effect of, on terminal shape of geomagnetic field (Spreiter 1967)
- Solar flare effects on (Veldkamp 1954)

## ROCKET MEASUREMENTS

- Of ionospheric currents near the equator (Cahill 1958)
- Of transient fine structure of E layer (Dieminger 1959)
- Of daytime electron density to 620 km using Doppler technique over Wallops Island (Jackson 1961)
- Evidence for ionospheric currents near geomagnetic equator, from (Maple 1951)
- Of electron density in F region (Nisbet 1960)
- Evidence of ionospheric currents from, near magnetic equator (Singer 1951)
- In exploration of magnetic fields and electric currents in upper atmosphere (Singer 1954)

## SAN JUAN, PUERTO RICO

Stratospheric air studies at (Belmont 1962)

## SATELLITE (see also FARADAY EFFECT)

Faraday determination of electron density using (Blackband 1960)

Studies of the equatorial ionosphere by (Blumle 1961)

Observations of electron content by (Blumle 1962)

Observations of the equatorial ionosphere by (Blumle 1962)

Topside spread F from (Calvert 1963)

Faraday determination of electron density using (Garriott 1960)

Measurements of the South Atlantic magnetic anomaly by (Heckman 1962)

High-frequency fading of 108-Mc/s wave from, as observed at an equatorial station (Kent 1961)

Ionospheric electron content calculated from a hybrid Faraday-Doppler technique using (Mendonca 1962)

Investigation of HF ionospheric propagation using (Ross 1961)

Evidence for a further ionospheric ledge above the F2 region from, ARIEL data (Sayers 1962)

Ground stations, IGY vector field proton magnetometer for (Shapiro 1960)

Scintillation of radio transmissions from, due to field-aligned irregularities (Singleton 1961)

Scintillation of radio transmissions from, Explorer VII (Singleton 1962)

Ionospheric disturbances associated with, Echo I (Tiuri 1963)

Ionospheric electron content and its variation deduced from (Yeh 1961)

## SCATTERING

Increase of, in F layer at sunset (Appleton 1960)

Fading of waves weakly scattered at vertical incidence (Awe 1961)

Long distance (Banerjee, S. S., 1951)

Of radio waves, and horizontal gradient of ionization (Banerjee, S. S., 1953)

Of short-wave radio signals (Banerjee, S. S., 1953)

From F-layer in the Far East during IGY (Bateman 1959)

To explain decrease in cosmic noise on disturbed days (Bhonsle 1960)

## SCATTERING (Continued)

- Of radio waves, by the F region (Booker 1938)
- In VHF research program at NBS, during IGY (Bowles 1957)
- Phenomena of, in equatorial ionosphere (Bowles 1960)
- Radar observations of new forms of, in ionosphere (Bowles 1962)
- From sporadic E, near the magnetic equator (Bowles 1962)
- Of radio waves, in the ionosphere (Clemesha 1962)
- VHF ionospheric, near magnetic equator during IGY (Cohen 1963)
- Cross-section for electrons analyzed (Cook 1961)
- Transequatorial, scintillation and spread F (Koster 1960)
- Summary of, in forward propagation (Lepechinsky 1955)
- SID effect on VHF propagation via (Obayashi 1960)
- New type, observed by shipborne ionospheric sounder over sea (Okamoto 1957)
- In F-region, and sporadic E peculiarities in Far East ionosphere (Smith 1960)
- At Huancayo, in relation to radio star scintillation (Wells 1954)

## SCINTILLATIONS (see also RADIO STAR OBSERVATIONS; IRREGULARITIES; and SPREAD F)

- Spread F over Kodaikanal and (Bhargava 1958)
- Studies of ionospheric irregularities causing (Briggs 1958)
- Observations of, over a solar cycle (Briggs 1964)
- Measurements of irregularities giving rise to, at equator (Koster 1963)
- Of satellite transmissions, due to field-aligned irregularities (Singleton 1961)
- And latitude distribution of ionospheric irregularities (Singleton 1961)
- Of radio transmissions, from Explorer VII (Singleton 1962)
- Of radio stars, in relation to F scatter at Huancayo (Wells 1954)
- Of radio stars, and spread F echoes observed at Achimota (Wright, R. W., 1956)

## SHORT-PATH COMMUNICATION

- Via ionosphere near the geomagnetic equator (Hagn 1963)

## SINGAPORE

- Sunset fading effects at (Bennington 1960)
- Twenty-seven-day variations in absorption of D region of (Lange-Hesse 1953)
- Ionospheric changes at, during solar eclipse 20 June 1955 (Minnis 1957)
- Ionospheric changes at, during solar eclipse 14 December 1955 (Minnis 1959)
- Ionospheric behavior in F2 region at (Osborne, B. W., 1951)
- Lunar variation in critical frequency at (Osborne, B. W., 1952)
- Electron content of F2 layer above (Osborne, B. W., 1953)
- Horizontal movements of ionization in F region at (Osborne, B. W., 1955)
- Fading on 9.69-Mc/s BBC station at, received in California (Yeh 1958)

## SKYWAVE (see also FIELD STRENGTH)

- Calculation for, at HF (Laitinen 1950)
- Calculation for, median field strength (Piggott 1959)

## SLANT SPORADIC E (see SPORADIC E)

## SLOUGH, ENGLAND

- Spread F over (Briggs 1958)
- Observations of spread F and scintillations over a solar cycle at (Briggs 1964)
- Twenty-seven-day variation in absorption of  $o^{\circ}$  region of the ionosphere over (Lange-Hesse 1953)
- Measurement of E-layer night critical frequencies at (Piggott 1955)

## SOLAR ACTIVITY (see also SOLAR FLARE)

- Variation of, ultra-violet, as revealed by ionospheric and geomagnetic observations (Allen 1946)
- $f_oF_2$  related to indices of (Bazzard 1961)
- Influence of, on geomagnetic distortion of the equatorial F2 region (Bhargava 1962)
- Ionization density in F2 layer and (Lal 1963)



## **SOLAR ACTIVITY (Continued)**

Related to ionospheric irregularities and earth magnetism (Lejay 1959)  
Terrestrial magnetic and ionospheric effects associated with, bright chromospheric eruptions (McNish, 1937)  
Ionospheric changes associated with, event of 23 February 1956 (Minnis 1956)  
And some indices based on ionospheric and radio noise measurements (Minnis 1959)  
 $E_s$  occurrence in relation to (Mitra, R. K., 1963)  
Effect of enhanced, on F2 region at Waltair (Rao, B. R., 1958)  
MUF factor and (Rao, C.S.R., 1960)  
Variation of critical frequencies with (Rastogi 1957)  
Geomagnetic influence on F1 and F2 regions and (Rastogi 1959)  
Altitude of tropopause near equator and (Stranz 1959)

## **SOLAR ECLIPSE**

Ionospheric observations on F regions during, of April 19, 1953 (Datta, S., 1959)  
Effects of, on 25 February 1952 (Estrabaud 1952, 1953)  
Behavior of F2 region during (Gliddon 1962)  
Effects on ionosphere at Huancayo during, of 25 January 1944 (Ledig 1946)  
F2 region ionosphere soundings in equatorial Africa during, of 25 February 1952 (Lejay 1956)  
Of 25 February 1952, ionospheric behavior at Khartoum during (Minnis 1955)  
Of 20 June 1955, ionospheric changes in Singapore during (Minnis 1957)  
Of 14 December 1955, ionospheric changes at Singapore during (Minnis 1959)  
Of 14 February 1934, measurements of ionospheric heights and radio observations in South Sea Islands during (Minohara 1934)  
Partial, of 2 February 1952, and its effect on ionosphere (Mitra, S. N., 1953)  
Observations at Ahmedabad, field-strength measurements and vertical-incidence soundings during (Rastogi 1955, 1956, 1957, 1958, 1959)

#### **SOLAR ECLIPSE (Continued)**

Propagation of radio waves reflected from the ionosphere during  
(Rastogi 1960)

Of February 1962, observations of ionosphere in New Guinea  
(Yamada 1963)

And geomagnetic crochet of 15 November 1960 (Yasuhara 1961)

#### **SOLAR FLARE (see also SOLAR ACTIVITY)**

Study of, using cosmic noise (Bhonsle 1960)

In study of short-period variations in the ionosphere using  
instantaneous frequency measurements (Chan 1962)

On trans-Sahara path, studied by Doppler technique (Davies 1962)

And changes in electron density over Ahmedabad (Degaonkar 1961)

Equatorial electrojet in Peru related to (Forbush 1950, 1961)

Effects, on 2.5- and 5.0-Mc/s atmospheric radio noise (Herman 1961)

Effects, in F region (Knecht 1962)

Of 23 February 1956, ionospheric changes observed at Singapore,  
Inverness, and Slough (Minnis 1956)

Type variation of, and the conductivity of the ionosphere (Nagata  
1950, 1952)

And SID effect on VHF scatter propagation (Obayashi 1960)

On the location of the ionospheric current system causing geomagnetic  
solar flare effect (Rao, K.S.R., 1963)

Of 23 February 1956, and associated ionospheric effects at Ahmedabad  
(Ramanathan 1956)

And study of S.E.A. at Delhi (Sachdev 1958)

Effects on equatorial electrojet (Veldkamp 1954, 1960)

#### **SOLAR TIDES (see also LUNAR TIDE)**

Conclusion about ionosphere from (Bartels 1936)

Geomagnetic data on (Bartels 1946)

In ionosphere over Calcutta (Mitra, A. P., 1951)

Effects of, in F2 region of ionosphere over Delhi (Rao, C.S.R., 1957)

On the seasonal variation in lunar and, in equatorial region  
(Rao, K.S.R., 1961)

SOUNDERS (see also EQUIPMENT)

Low-power ionosondes (Busch 1963)

Systems concepts for a common-user radio transmission sounding system (Gould 1962)

SPLITTING (see also GYROFREQUENCY)

Of pre-sunrise F layer (Bandyopadhyay 1959)

Of F layer over Calcutta on quiet and disturbed days (Bandyopadhyay 1960)

Early observation of, at Huancayo (Berkner 1934)

Studies, on spread F, double F, and forked F at Calcutta (Datta, R. N., 1960)

And measurement of gyrofrequency at F region heights above Hobart, Tasmania (Ellis 1957)

Magneto-ionic triple splitting over Delhi (Mitra, S. N., 1955)

Triple splitting of F echoes (Satyanarayana 1959)

SPORADIC E (see also ELECTROJET)

And polarization of echoes at Waltair-- $E_{sq}$ ,  $E_{sl}$  (Abhirama Reddy 1962)

Structure of, as deduced from polarization-- $E_{sq}$  (Abhirama Reddy 1963)

Error in predicted MUF due to, on transequatorial path (Allcock 1956)

Some aspects of, at Huancayo-- $E_{sq}$ ,  $E_{sr}$ ,  $E_{sf}$  (Bandyopadhyay 1963)

Studies of (Banerjee, R. B., 1951)

Studies on (Baral 1948, 1952)

At Huancayo and Watheroo (Berkner 1937)

Effect of Sq current system on (Beynon 1959)

Relationship to thunderstorms (Bhar 1939)

Geomagnetic disturbances in equatorial-- $E_{sq}$  (Bhargava 1961)

Lunar tidal effect in-- $E_{sq}$  (Bhargava 1963)

Interpretation of echoes from (Bibl 1959)

Some characteristics of (Bossolasco 1959)

Fading of VHF, equatorial electrojet, and-- $E_{sq}$ ,  $E_{ss}$  (Bowles 1960)

Near the magnetic equator-- $E_{sq}$ ,  $E_{ss}$  (Bowles 1960, 1962)

## SPORADIC E (Continued)

- Echoes in east-west plane from, equatorial-- $E_{ss}$  (Bowles 1962)
- Observations of waves reflected from (Briggs 1951, 1954)
- Variations in frequency of occurrence of (Chadwick 1962)
- Nature and origin of, over Calcutta-- $E_{sq}$ ,  $E_{sm}$  (Chatterjee 1953)
- On the nature of, equatorial slant  $E_s$ -- $E_{ss}$ ,  $E_{sq}$  (Cohen 1962)
- Solar activity and the occurrence of (Das Gupta 1962)
- In temperate zone, report on the IGY oblique-incidence program (Finney 1960)
- Field-aligned irregularities in-- $E_{ss}$ ,  $E_{sc}$ ,  $E_{sq}$ ,  $E_D$  (Goodwin 1962, 1963)
- Observations of occurrence and movement of (Harwood 1961)
- In temperate zone (Heisler 1960)
- Rapid variations in-- $E_{sn}$  (Heisler 1962)
- Occurrence, correlation with horizontal geomagnetic field component (Heisler 1964)
- Irregularities in E region, caused by atmospheric electricity (Isted 1955)
- Left-handed ionospheric echo from (Khastgir 1960)
- Spiral distribution of, in polar regions (Kamiyama 1962)
- And dependence of  $f_oE_s$  on ionosonde system gain-- $E_{sn}$ ,  $E_{sq}$  (Kerblat 1960)
- Additional lunar influence on, at Huancayo-- $E_{sq}$  (Knecht 1959)
- On the width of the equatorial belt of-- $E_{sq}$  (Knecht 1962)
- Over Ahmedabad-- $E_{sn}$ ,  $E_{sc}$ ,  $E_{ss}$  (Kotadia 1956)
- Equatorial zone, and the electrojet (Kotadia 1962)
- Occurrence of, during IGY (Leighton 1962)
- Geomagnetic and ionospheric relations and (Lewis 1953)
- Theoretical interpretation on, equatorial-- $E_{sq}$  (Maeda, K., 1963)
- $E_s$ -region ionization, spread F, and radio star scintillation-- $E_{sq}$ ,  $E_{sn}$  (Martyn 1959)
- Intense, near the magnetic equator and at the auroral zone (Matsushita 1951, 1952)
- Lunar tidal variations in (Matsushita 1953)
- Some studies of (Matsushita 1954)
- Lunar effects on-- $E_{sq}$  (Matsushita 1955, 1957)

## SPORADIC E (Continued)

- And ionospheric currents-- $E_{sq}$ ,  $E_{ss}$ ,  $E_{sr}$ ,  $E_{sf}$  (Matsushita 1962)
- Occurrences in relation to solar activity (Mitra, R. K., 1963)
- Scatter, and F layer scatter, observation of at VHF-- $E_s$  type M (Miya 1961)
- Characteristics of, in  $E_s$  region at Brisbane-- $E_{sh}$ ,  $E_{sq}$  (McNicol 1951)
- Variation after sunset at Slough (Piggott 1955)
- At Kodaikanal-- $E_{sq}$ ,  $E_{sn}$  (Rangarajan 1954)
- And the equatorial electrojet (Rao, C.S.R., 1964)
- Effect of electrojet on seasonal variation of (Rao, M. M., 1963)
- Thunderstorms and (Rastogi 1957)
- Effect of magnetic equator on (Rawer 1953)
- Irregularity and regularity of (Rawer 1955)
- Study of transparency of (Rawer 1960)
- Structure at Waltair, deduced from polarization observations-- $E_{sq}$  (Reddy 1963)
- Overhead non-blanketing, theory of-- $E_{sq}$  (Renau 1961)
- Polarization of echoes from (Satyanarayana 1956)
- Equatorial, negligible effect on cosmic noise absorption on 25 Mc/s (Shirke 1962)
- Study of blanketing, from analysis of C-4 ionograms (Singh, R. N., 1963)
- Effect of equatorial electrojet on-- $E_{sq}$  (Skinner 1957)
- Reflection coefficient of, at Ibadan-- $E_{sq}$ ,  $E_{sh}$  (Skinner 1962)
- Slant, some implications of-- $E_{ss}$  (Smith, E. K., 1957)
- World-wide occurrence of (Smith, E. K., 1957)--all types classified
- Observed on VHF oblique-incidence circuits (Smith, E. K., 1958)
- Peculiarities of ionosphere in Far East, sporadic E and F region scatter (Smith, E. K., 1960)
- At Brisbane-- $E_{ss}$ ,  $E_{sc}$  (Thomas 1955, 1956)
- Survey of the present knowledge of (Thomas 1959)--type classification
- Focusing of electromagnetic waves (Umlauf 1960)
- Some studies on, at Tirupati, India (Venkateswarlu 1961)
- At Watheroo (Wells 1946)
- Formation of, from vertical gradient in horizontal wind (Whitehead 1962)

## SPORADIC E (Continued)

- Equatorial, theory of (Whitehead 1963)
- Lunar tides in, at Ibadan (Wright 1959)
- Geographical extent of, in Africa-- $E_{sq}$  (Wright 1962)
- Measurements to determine width of equatorial-- $E_{sq}$  (Wright, R. W., 1963)

## SPREAD F (see also ECHOES; FLUTTER FADING; IRREGULARITIES; SCINTILLATION)

- Equatorial ionospheric effects of (Bennington 1960)
- Observations of, spread echoes from the F layer over Kodaikanal (Bhargava 1958)
- Relationship between ripple amplitude of, and layer height (Bowman 1960)
- Study of irregularities causing (Briggs 1958)
- Observations of, over a solar cycle (Briggs 1964)
- Interpretation, and synthesis of configurations on equatorial ionograms (Calvert 1961)
- Equatorial (Calvert 1962)
- Motions of equatorial (Calvert 1963)
- Topside, rocket (Calvert 1963)
- Topside, satellite (Calvert 1963)
- Nature of, equatorial (Cohen 1961)
- Studies of, and double F and forked F at Calcutta (Datta, R. N., 1960)
- Survey of (Glover 1960)
- Possibility of detecting ionospheric drifts from the occurrence of (Knecht 1960)
- Scintillation, equatorial scatter, and (Koster 1950)
- Effect of magnetic activity and F-region height changes on (Krishnamurthy 1963)
- Echoes, fading characteristics of (Krishnamurthy 1963)
- Nocturnal and seasonal variations of (Krishnamurthy 1963)
- Time of onset of, in relation to post-sunset  $h'f$  variations (Krishnamurthy 1963)
- Connection with flutter fading, magnetic storms, and radiation belt (Lal 1960)
- Equatorial, and magnetic activity (Lyon 1958)

## SPREAD F (Continued)

Belt of, equatorial (Lyon 1960)  
F-layer heights and (Lyon 1960)  
Geomorphology of, equatorial (Lyon 1960)  
Equatorial, at Ibadan, Nigeria (Lyon 1961)  
Classifications of, on ionograms (Penndorf 1962)  
In the F2 region near the magnetic equator (Purslow 1958)  
Study of, equatorial (Rangaswamy 1963)  
Geomagnetic activity and (Rao, C.V.S., 1962)  
Correlation of, activity, with F-region height changes (Rao, M.S.V.G., 1960)  
Study, fading of CW signals as a means of (Rao, M.S.V.G., 1960)  
Effects of, on CW transmissions (Rao, M.S.V.G., 1961)  
Nocturnal and seasonal variations of (Rao, M.S.V.G., 1961)  
Relation to post-sunset height changes and magnetic activity (Rao, M.S.V.G., 1961)  
Correlation of, on one night and the successive nights (Rao, M.S.V.G., 1962)  
Phenomena during growth and decay of (Rao, M.S.V.G., 1963)  
Over Hawaii (Reber 1954)  
World-wide (Reber 1956)  
Theory of, based on scattering-screen model (Renau 1959)  
Theory of, based on aspect-sensitive echoes (Renau 1960)  
Observed, study of (Renau 1960)  
And rate of fading of reflected pulses at 2.6 and 4 Mc/s (Sethuraman 1958)  
Statistical study of world-wide occurrence probability of, for average state (Shimazaki 1959)  
World-wide occurrence probability of, in severe magnetic storm (Shimazaki 1959)  
Diurnal and seasonal variations of occurrence probability of (Shimazaki 1960)  
Geomorphology (Singleton 1960)  
And the latitude variation of whistler occurrence (Singleton 1961)  
And parameters of F layer (Singleton 1962)  
F-layer height and (Singleton 1962)



#### SPREAD F (Continued)

Vertical movement of F layer and (Singleton 1962)  
And F layer vertical movement (Singleton 1962)  
Spread-F equator (Singleton 1963)  
Echoes and radio star scintillation (Wright, R. W., 1956)  
Geomorphology of (Wright, R.W.H., 1959)  
Characteristics of equatorial (Wright, R.W.H., 1959)

#### Sq CURRENT (see also ELECTROJET, EQUATORIAL)

Recombination and (Allen 1946)  
Detection of, by sounding (Appleton 1955)  
Studies of E-layer morphology and (Appleton 1961)  
Geomagnetic distortion of E-region due to (Beynon 1959)  
Electrojet over Kodaikanal and (Bhargava, B. N., 1961)  
Relation to  $E_s$  (Bossolasco 1959)  
At low geographical latitudes (Chakrabarty 1946)  
Tidal theory of (Ingraham 1959)  
In three-dimensional consideration for current system of geomagnetic variations (Nishida 1959)  
Correlation to equatorial electrojet (Osborne, D. C., 1963)  
Effect of, on ionospheric E and F1 layers (Shimazaki 1959)

#### STRATIFICATION (see also SOLAR ECLIPSE)

At 150 kilometers near magnetic equator (Balsley 1964)  
Of F-region, observed at Huancayo (Berkner 1934)  
Of high F-region: F3, or lunar layer or G scatter (Bibl 1963)

#### STRATOSPHERE

Tropical upper-air studies (Belmont 1962)

#### SUDDEN COMMENCEMENT (see also GEOMAGNETIC)

Ionospheric changes associated with (Appleton 1950)  
Changes in field near geomagnetic equator and (Ashour 1964)



#### SUDDEN COMMENCEMENT (Continued)

- Observed by geomagnetic fluctuations in period range 0.3 to 120 seconds (Benioff 1960)
- Observed with Doppler technique (Davies 1962)
- Propagation velocity of (Dessler 1958)
- Daytime enhancement of size, at Huancayo (Forbush 1955)
- Propagation of (Gerard 1959)
- Equatorial enhancement of (Jacobs 1963)
- Ionospheric currents responsible for (Ondoh 1961)
- Longitudinal irregularities in lunar tide, and, near magnetic equator (Rastogi 1963)

#### SUNRISE

- The early-morning E2 layer and some evidence of presunrise F layer splitting (Bandyopadhyay 1959)
- Effects on F region over Kodaikanal (Bhargava 1952)
- Modification of effect during magnetic storms (Bhargava 1962)
- Effect on VLF (Rieker 1963)
- F layer at (Rishbeth 1960)
- Presunrise splitting and lunar tide (Rastogi 1963)

#### SUNSET (see also FLUTTER FADING)

- Effect on equatorial ionosphere (Appleton 1954)
- Rapid rise of F layer after (Appleton 1960)
- Fading effects at Singapore, Johannesburg, and Ibadan (Bennington 1960)
- Frequency-spreading of spread F near (Bowman 1960)
- Instability of equatorial F layer after (Calvert 1963)
- Effect, equatorial (Humby 1959)
- Fading effect, some measurements of (Koster 1963)
- On the cooling of the upper atmosphere after (Lowan 1955)
- Rise of  $f_oF_2$  after (Rao, B.C.N., 1963)

## SUNSPOT CYCLE

- Linear relation between  $f_oF2$  and sunspot numbers of (Allen 1946)
- Relation between F2 criticals, virtual heights, and (Allen 1953)
- Equatorial trough variation and (Appleton 1960)
- Relationship to magnetic variation (Bartels 1939)
- Geomagnetic data and (Bartels 1946)
- Relationship between magnetic activity and F-layer critical frequency and (Bergh 1961, 1962)
- Lack of correlation of non-seasonal component of noon  $f_oF2$  with (Berkner 1938)
- Widening of anomalous equatorial belt during maximum of (Bhargava 1961)
- Fluctuation of F2 ionization and (Bibl 1963)
- Inverse variation of spread F with (Bowman 1960)
- Observations of spread F over (Briggs 1964)
- Ionospheric F2 layer of Ahmedabad, Delhi, and Tiruchirapalli during minimum of (Kotadia 1956)
- F-region anomaly in the African, American, and East Asian equatorial sectors during maximum of (Lyon 1963)
- Influences on spread F at Baguio (Marsigan 1960)
- Study of geomagnetic anomaly during maximum of (Rao, C.S.R., 1962)

## SUPER-REFRACTION (see also REFRACTION)

- Atmospheric and anomalous propagation of radio waves off the coast of Natal (Phillips, W. E., 1951)

## SYMPOSIA (see also BIBLIOGRAPHY)

- Proc. Israel 5th Annual Conference on Aviation and Astronautics (Altman 1963)
- International symposium on equatorial aeronomy-introduction (Cohen 1963), (agenda on page 227)
- Report of committee to promote observations of daily variation of horizontal magnetic force between and near the equators (Egedal 1951)
- Exosphere and upper F region (Hines 1960)
- Dynamic characteristics of ionosphere (Johnson, M. H., 1950, Martyn 1950, McNish 1950)

SYMPOSIA (Continued)

- Conference on ionospheric physics (Pennsylvania State College 1950)
- International symposium on equatorial aeronomy (Smith, E. K., 1962)
- International symposium on fluid mechanics in the ionosphere (1959),  
(agenda on page 228)

#### **TALARA, PERU**

Anomaly in total electron content over (Altman 1963)

Electron density at, during solar maximum (Schmerling 1958, 1959, 1960, 1961)

Electron density and true-height variations at, during IGY quiet days (Somayajulu 1963)

#### **TAMANRASSET, ALGERIA**

Airglow studies at (Barbier 1959, 1961)

#### **THUNDERSTORM (see also ATMOSPHERIC NOISE; LIGHTNING)**

Relationship to  $E_s$  not supported (Berkner 1937)

Relationship to  $E_s$  apparent (Bhar 1959)

Days of, on land mass of India (Chandrashekhar Aiya 1954)

Noise power radiated by, tropical (Chandrashekhar Aiya 1955)

Tropical, as noise radiators (Chandrashekhar Aiya 1955)

Noise from, in standard broadcast band (Chandrashekhar Aiya 1956)

HF noise from, in tropics (Chandrashekhar Aiya 1960)

In Spring, over Bangalore (Chandrashekhar Aiya 1963)

#### **TILT (see also HORIZONTAL GRADIENTS)**

Polarimeter for study of (Benner 1950)

Comparative directional measurements of (Bramley 1955)

Equatorial (Somayajulu 1963)

Observed with backscatter on transequatorial paths (Thomas 1962)

Anomalous transequatorial propagation caused by--ionospheric height and frequency plots (Thomas 1962)

Revealed by anomalous transequatorial ionosphere (Villard 1957)

Effective, of the ionosphere at places 1000 kilometers apart (Whale 1955, 1956)

Resulting modes of HF propagation and (Yeh 1960)

#### **TIRUPATI, INDIA**

Studies on sporadic E at (Venkateswarlu 1961)

## TIRUCHIRAPALLI, INDIA

Ionospheric F2 layer during sunspot minimum (Kotadia 1956)

## TOPSIDE SOUNDING

Studies of spread F using (Calvert 1963)

Of the ionosphere (Knecht 1962)

Low-latitude field-aligned ionization observed by, Alouette satellite (Lockwood 1963)

Propagation along field-aligned sheets of ionization observed by, Alouette (Muldrew 1963)

## TOWNSVILLE, AUSTRALIA

Anomalous transequatorial VHF propagation recorded at (Carman 1963)

## TRANSEQUATORIAL

Virginia to Ghana on 17.5 Mc/s (Agy 1962)

Prediction of MUF over paths (Allcock 1956)

Study of scatter mode (ARRL 1959)

Anomalous VHF propagation (Carman 1963)

Reception of VLF (Chilton 1964)

Propagation of VHF signals (Cracknell 1959, 1960)

Enhanced propagation following geomagnetic storms (Ferrell 1951)

Study of propagation phenomena (HRB-Singer, Inc. 1961)

Scatter, scintillation, and spread F (Koster 1960)

Nighttime scatter at 50 Mc/s (Southworth 1960)

Backscatter observations of magnetically controlled ionization at Brisbane (Thomas 1961)

Propagation, general effects (see Thomas 1961 through 1964)

Instrumentation for observation for field-aligned F-region irregularities (Thomas 1962)

Ray tracing and mode analysis (Thomas 1962)

Observations of propagation from Brisbane (Thomas 1962)

Lunar control of abnormal propagation (Thomas 1962)

Anomalous propagation, cross and auto correlation effects associated with, at 16 Mc/s (Thomas 1962)

#### **TRANSEQUATORIAL (Continued)**

Field-aligned irregularities (Thomas 1962)  
Studies of propagation by scatter sounding method (Villard 1957)  
New evidence of anomalous propagation (Villard 1957)  
F-layer propagation study (Washburn 1963)  
New type of fading observed on HF paths (Yeh 1958)

#### **TRANSMISSION LOSS, IONOSPHERIC**

On 8500-km path between Sterling, Va. and Accra, Ghana (Agy 1962)  
Penetration of thin ionospheric layers (Deb 1940)

#### **TRAVELLING DISTURBANCE**

Fluctuation of F2 ionization and (Bibl 1963)  
Variations of instantaneous frequency observations of large scale  
TD, related to geomagnetic sudden impulses (Chan 1962)  
In ionosphere (Munro 1950, 1956, 1957)  
CW radio method of studying (Rac, B. R., 1954)  
In F over Walair (Rao, E. B., 1961)  
Investigation of, by CW (Somayajulu 1953)  
Detection of rapidly moving ionospheric clouds (Wells 1946)

#### **TRIPOLI, LIBYA**

HF path between Accra, Ghana and (Barghausen 1964)  
Equatorial flutter fading between Accra, Ghana, and (Calvert 1962)

#### **TRIVANDRUM, INDIA**

Electron density in ionosphere over (Rao, C.S.R., 1961)  
Geomagnetic activity and spread F at (Rao, C.V.S., 1962)

#### **TROPICAL COMMUNICATION (see also JUNGLE RADIO COMMUNICATION)**

Calculation of median sky-wave field strength in tropics (Piggott 1959)  
Improved intercontinental communications (Rodam 1944)

## TROPICAL COMMUNICATION (Continued)

Research engineering and support for tropical communications  
(Vincent 1963)

## TRUE HEIGHT (see also VIRTUAL HEIGHT)

New calculation methods (Becker 1959)

Early morning variation of F region over Calcutta (Ghosh, S. P.,  
1940)

Effect of magnetic activity and F-region height change on equatorial  
spread F (Krishnamurthy 1963)

Equatorial spread F and F layer height (Lyon 1960)

Estimation of heaviside layers in Bengal (Rakshit 1931)

Measurements of ionospheric heights at Calcutta (Rakshit 1934)

Coefficients for rapid reduction of  $h'f$ -records to  $N(h)$  profiles  
without computer aids (Schmerling 1959)

Some results of IGY survey (Schmerling 1961)

By method of signal fading (Sen Gupta 1936)

Spread F and F-layer height (Singleton 1962)

Calculation of real and virtual heights (Titheridge 1959)

Ionospheric height measurement at Allahabad (Toshnival 1944)

## TSUMEB, SOUTHWEST AFRICA

F-layer phenomena at (Dieminger 1960)

Reflecting properties of ionosphere between 350 and 1500 kc/s at  
(Elling 1960)

Sporadic E at (Umlauf 1960)

**UHF**

**Air-to-ground propagation in band nine (Kirby 1963)**



## VELOCITY

- Curves for radio wave propagation (Bajpai 1937)
- Group velocities and group heights from magnetoionic theory (Shinn 1952)

## VERTICAL INCIDENCE (see also CRITICAL FREQUENCIES, $f_oF_2$ )

- Ionospheric critical frequencies and magnetic parameters (Bergh 1961)
- Ionospheric observations over Atlantic Ocean (Bukin 1961)
- Studies on ionospheric tidal effect on critical frequencies at Huancaño (Burkard 1951)
- Penetration of thin ionospheric layers at (Deb 1940)
- Solar eclipse 25 February 1952 in equatorial Africa--effects on E region (Estrabaud 1953)
- Correlation analysis of fading of radio waves reflected at (Fooks 1961)
- Observations of occurrence and movement of sporadic-E ionization (Harwood 1961)
- Relationship between  $f_oF_2$  and magnetic phenomena (King 1962)

## VHF PROPAGATION

- NBS scatter research program (Bowles 1957)
- Transmissions across the magnetic equator (Bowles 1960)
- Anomalous transequatorial (Carman 1963)
- Propagation curves for broadcasting in Africa (CCIR 1963)
- Scatter (Cohen 1963)
- Radio-wave attenuation through jungle and woods for (Krevsky 1963)
- SID effect on VHF scatter associated with solar outburst 29 July 1958 (Obayashi 1960)
- Sporadic E observed on oblique-incidence circuits (Smith 1958)
- Nighttime equatorial scatter on 50- and 144-Mc/s--radio amateur VHF transequatorial scatter observations during IGY (Southworth 1960)
- VHF transequatorial propagation via F layer (Washburn 1963)

## **VIRTUAL HEIGHT (see also TRUE HEIGHT)**

Variation of noon values (Appleton 1950)

Rapid increase of, for F layer after sunset (Appleton 1960)

Calculation of (Titheridge 1959)

Analysis of nighttime  $h'(f)$  records (Titheridge 1961)

New method for analysis of ionospheric  $h'(f)$  records (Titheridge 1961)

Measurements in Bengal (Sen Gupta 1936)

## **VLF PROPAGATION**

Measurements for the Radux-Omega navigation system (Casselman 1959)

Transequatorial reception of (Chilton 1964)

Mode theory of, in presence of transverse magnetic field (Crombie 1960)

Reflection from a sharply bounded ionosphere for propagation perpendicular to the magnetic meridian (Crombie 1961)

Nonreciprocity along magnetic equator (Crombie 1963)

Attempt to observe whistlers near magnetic equator (Koster 1955)

Sunrise and sunset effects on (Rieker 1962)

Summary of literature pertaining to (Whitson 1962)

WALTAIR, INDIA

- Polarization of  $E_s$  echoes at (Abhirama Reddy 1962)
- Structure of  $E_s$  at, as deduced from polarization observations  
(Abhirama Reddy 1963)
- Z echo at (Abhirama Reddy 1963)
- Theoretical wave polarization at vertical incidence  
(Abhirama Reddy 1963)
- Nocturnal and seasonal variations of spread F at  
(Krishnamurthy 1963)
- Absorption on 5.65 Mc/s at (Ramana 1961)
- Horizontal drifts in F2 region at (Rao, A. S., 1963)
- Horizontal drifts in E region at (Rao, A. S., 1964)
- Investigations of ionospheric wind by spaced receiver method at  
(Rao, B. R., 1956)
- Diurnal variation of absorption at (Rao, B. R., 1958)
- Effect of enhanced solar activity on F2 region drifts at  
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- Effect of magnetic activity on drifts over F2 regions at  
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- Study of horizontal drifts in F1 and F2 regions at  
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- F1 region drifts at (Rao, E. B., 1961)
- Study of drifts at (Rao, E. B., 1961)
- The F region over (Rao, E. B., 1961)
- Long-period fading in medium radio signals at  
(Rao, M. S., 1955)
- Influence of weather conditions on field strengths received at,  
by a long-distance short wave transmission (Rao, N. S. S., 1950)
- Horizontal drifts in E region at (Rao, R. R., 1960)
- Height gradient of horizontal drift in E region over  
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- Investigation of traveling disturbance by CW at (Somayajulu 1953)

#### WASHINGTON, D.C.

- Anomaly in total electron content--summer decrease (Altman 1963)
- Non-seasonal changes of F2-region ion density at (Berkner 1938)
- Requency of occurrence of  $E_s$  over (Chadwick 1962)

#### WATHEROO, AUSTRALIA

- Small differences in monthly mean  $f_oF_2$  at (Bannon 1946)
- Characteristics of upper ionosphere at (Berkner 1936)
- Abnormal ionization of E region at (Berkner (Berkner 1937)
- Non-seasonal change of  $f_oF_2$  region at (Berkner 1938)
- Ionospheric changes (Berkner 1940)
- Systematic ionospheric changes (Berkner 1940)

#### WEATHER

- At Macao, correlated with ionospheric height (Gherzi 1952)
- The influence of weather conditions on long distance short wave transmission (Rao, N. S. S., 1950)

#### WINDS

- Tropical upper air studies (Belmont 1962)
- Some phenomena of the upper atmosphere (Chapman 1951)
- In the dynamo mechanism for the magnetic diurnal variation (Forbush 1950)
- Interpretation of, as drifts in F2 region (Martyn 1955)
- Ionospheric, at Waltair (Rao, B. R., 1954, 1956)
- Stratospheric, and 26 or 27-month periodicity in equatorial geomagnetic field (Stacey 1962)
- Ionospheric current systems caused by, non-periodic (Van Sabben 1962)

Z ECHO (see also SPLITTING, POLARIZATION)

At Waltair (Abhirama Reddy 1963)

Attributed to partial reflection of ordinary echo  
(Satyanarayana 1959)